

Topic: The Marking/Fixed Slope Function of DVP Series PLCs

Applicable model	DVP-EH3 series, DVP-SV2 series, DVP-ES2/EX2 series, DVP-SX2 series, DVP-SA2 series, DVP-SS2 series, DVP-SE series
Keyword	Marking function, masking function, fixed slope

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1 Preface and Purpose

Preface:

Marking is a function that, high-speed output will immediately decrease and stop according to deceleration time or the number of deceleration pulses if an external interrupt occurs during a high-speed output process. It is applicable to labelers or similar control requirements.

A fixed slope depends on a starting frequency, a closing frequency, the maximum frequency of the fixed slope, acceleration time, and deceleration time. It does not vary with a target frequency, and can be used to drive step motors.

This document introduces marking actions (front marking actions and back masking) and fixed slopes. Delta DVP series PLCs are used in this document.

Purpose:

This document helps users understand the marking and fixed slope functions to which specific pulse output instructions supported by Delta PLCs correspond.

Chapter structure:

1. Applicable models, instructions, and special D/M devices to which marking and fixed slope actions correspond
2. Single-speed marking action
3. Single-speed masking and marking actions
4. Two-speed marking action
5. Fixed slope action
6. A~C marking action

2 Marking and Fixed Slopes

2.1 Applicable Models and Starting Versions

Model Function	EH3/SV2	ES2/EX2/ES2-C	ES2-E	12SA2/SX2	SS2	12SE	26SE	28SA2
Modification of marking	V1.88	V3.28	V1.0	V2.82	V3.28	V2.0	V2.0	V3.0
Fixed slope	V1.88	V3.28	V1.0	V2.82	V3.24	V2.0	V2.0	V3.0

2.2 Corresponding Instructions

EH3/SV2/ES2/EX2/ES2-C/ES2-E/12SA2/SX2/SS2/26SE/28SA2 :

Function	Instruction
Marking	DRVI, DDRVI, DRVA, DDRVA, PLSR, DPLSR, DCLLM
Fixed slope	DRVI, DDRVI, DRVA, DDRVA, PLSR, DPLSR

3 Special D/M Devices Corresponding to the Marking and Fixed Slope Functions

3.1 Special D/M Devices Corresponding to the Marking Function

EH3/SV2:

- The output channels supported by the marking function are CH0~CH3. M1156~M1159 are marking deceleration flags. X0~X3 are corresponding external interrupt input points. Acceleration time, deceleration time, a starting frequency, and a closing frequency are set according to requirements.
- The masking function is controlled by special D devices and special M devices.

Special D devices: If the value in (D1026, D1027)/(D1136, D1135)/(D1155, D1154) is less than or equal to 0, the front masking function will be disabled. If the value in (D1026, D1027)/(D1136, D1135)/(D1155, D1154) is greater than 0, the front masking function will be enabled. If the value in (D1167, D1166) is less than or equal to 0, the back masking function will be disabled. If the value in (D1167, D1166) is greater than 0, the back masking function will be enabled. The use of special D devices to set the front masking function supports CH0~CH2, and the use of special D devices to set back masking function supports CH0. Please refer to section 5 for more information.

Special M devices: If a special M device in the range of M1610 to M1613 is ON, the output corresponding to the special M device will execute the masking function, and will not accept any marking external input interrupts. If a special M device in the range of M1610 to M1613 is OFF, the output corresponding to the special M device will not execute the masking function, and will accept marking external input interrupts. The use of special M devices to set the masking function supports CH0~CH3.

Output number	Marking deceleration flag	Masking flag	External input point	Acceleration time	Deceleration time	Starting/ Closing frequency	Number of deceleration pulses after marking	Front masking	Interrupt area
CH0 (Y0/Y1)	M1156	M1610	X0	D1343	D1348	D1340	D1232/D1233	D1026/D1027	D1166/D1167
CH1 (Y2/Y3)	M1157	M1611	X1	D1353	D1349	D1352	D1234/D1235	D1135/D1136	NA
CH2 (Y4/Y5)	M1158	M1612	X2	D1381	D1350	D1379	D1236/D1237	D1154/D1155	NA
CH3 (Y6/Y7)	M1159	M1613	X3	D1382	D1351	D1380	D1238/D1239	NA	NA

ES2/EX2/ES2-C/ES2-E/12SA2/SX2/SS2/26SE/28SA2 :

- ES2/EX2/ES2-C (FW V3.46), ES2-E (V1.0 or later): DRVI/DDRVI and DRVA/DDRVA instructions added the following combinations for D₁ and D₂.

Output number (D ₁)	Y0	Y1	Y2	Y3
Corresponding direction output number (D ₂)	Y4	Y5	Y6	Y7

- The outputs Y0~Y3 support the marking function for executions of DRVI, DDRVI, PLSR and DPLSR instructions and the outputs Y0 and Y2 support the marking fuction for executions of DCLLM instruction. M1156 and M1158 are marking deceleration flags. X4 ~ X7 are corresponding external interrupt input points. Acceleration time, deceleration time, a starting frequency, and a closing frequency are set according to requirements.

- If the value in D1026, D1027, D1154, D1155, D1135, D1136, D1158, or D1159 is ≤ -4 or $= 0$, the front masking is disabled. If the value in D1026, D1027, D1154, D1155, D1135, D1136, D1158, or D1159 is >0 or $-4 \sim -3$, the front masking function is enabled. If the value in D1100, D1101, D1156, D1157, D1102, D1103, D1160, or D11619 is ≤ 0 , the back masking is disabled. If the value in D1100, D1101, D1156, D1157, D1102, D1103, D1160, or D11619 is >0 or if the corresponding values in D1026, D1027, D1154, D1155, D1135, D1136, D1158, or D1159 for the front masking is -3 , the back masking is enabled. The use of special D devices to set the front/back masking function is available for Y0~Y3.

Special D/M Devices Corresponding to the Marking and Masking Function

Output number	Marking deceleration flag	External input point	Acceleration time	Deceleration time	Starting/Closing frequency	Number of deceleration pulses after marking	Front masking	Back masking
Y0	M1156	X4	D1343	D1348	D1340	D1232/D1233	D1026/ D1027	D1100/ D1101
Y1	M1157	X5	NA	NA	NA	D1236/D1237	D1154/ D1155	D1156/ D1157
Y2	M1158	X6	D1353	D1349	D1352	D1234/D1235	D1135/ D1136	D1102/ D1103
Y3	M1159	X7	NA	NA	NA	D1238/D1239	D1158/ D1159	D1160/ D1161

- Added new marking behaviors A-C for PLSR/DPLSR and DRVI/DDRVI instructions and behavior B (-3) for DCLLM instruction.

Applicable Models and Starting Versions

Model	ES2/EX2/ES2-C	ES2-E	12SA2/SX2	SS2	12SE	26SE	28SA2
Firmware	V3.60	V1.20	V3.00	--	V2.02	V2.02	V3.0

- When a PLC outputs pulses at a high speed, it calculates the number of deceleration/acceleration pulses required, and automatically writes the number of deceleration/acceleration pulses to the special D devices described in the table below.

Special D device number	Function	Attribute
D1127/D1128	Number of acceleration pulses for a positioning instruction	Read-only
D1133/D1134	Number of deceleration pulses for a positioning instruction	Read-only

3.2 Special D/M Devices Corresponding to the Fixed Slope Function

EH3/SV2:

The channels CH0~CH3 support the fixed slope function. M1604~M1607 are used to enable fixed acceleration/deceleration slopes for CH0~CH3. D1410~D1413 and D1988~D1991 are used to set the maximum frequencies of the fixed acceleration/deceleration slopes for CH0~CH3.

Outputs	Fixed slope flag special M device	Maximum frequencies special D device
CH0 (Y0/Y1)	M1604	D1410/D1411
CH1 (Y2/Y3)	M1605	D1412/D1413
CH2 (Y4/Y5)	M1606	D1988/D1989
CH3 (Y6/Y7)	M1607	D1990/D1991

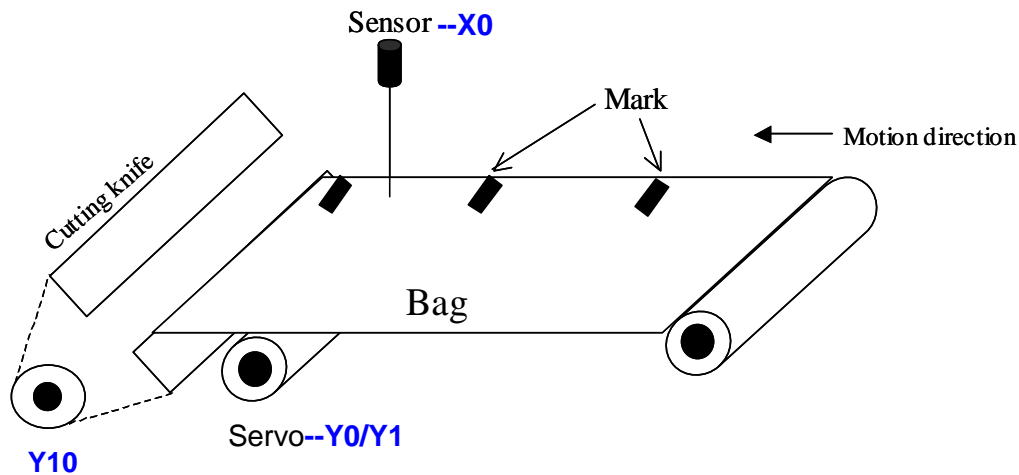
ES2/EX2/ES2-C/ES2-E/12SA2/SX2/SS2/26SE/28SA2 :

The outputs Y0~Y3 support the fixed slope function. M1604~M1607 are used to enable fixed acceleration/deceleration slopes for CH0~CH3. D1410~D1413 and D1988~D1991 are used to set the maximum frequencies of the fixed acceleration/deceleration slopes.

Outputs	Fixed slope flag special M device	Maximum frequencies special D device
Y0	M1604	D1410/D1411
Y1	M1606	D1988/D1989
Y2	M1605	D1412/D1413
Y3	M1607	D1990/D1991

4 Single-speed Marking Function—Bag Making Machine (Bags without Patterns)

【Mechanism diagram】



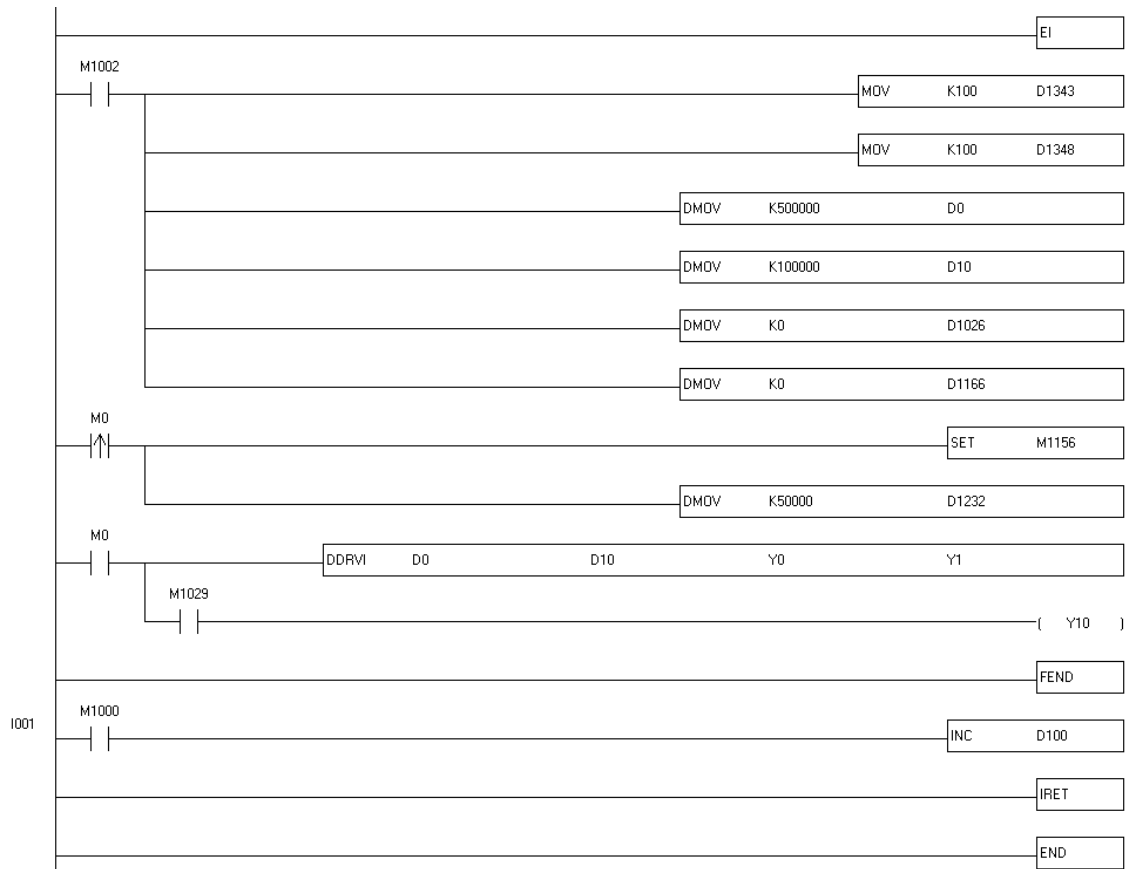
【Control requirement】

The instruction DDRVI is used to drive the servo which conveys bags. Bags are cut by means of the marking function. When the sensor detects the mark on a bag, the servo immediately decelerates and outputs 50000 pulses. When the servo stops, the cutting knife cuts the bag. (A DVP-EH3 series PLC is used in this example.)

【Device description】

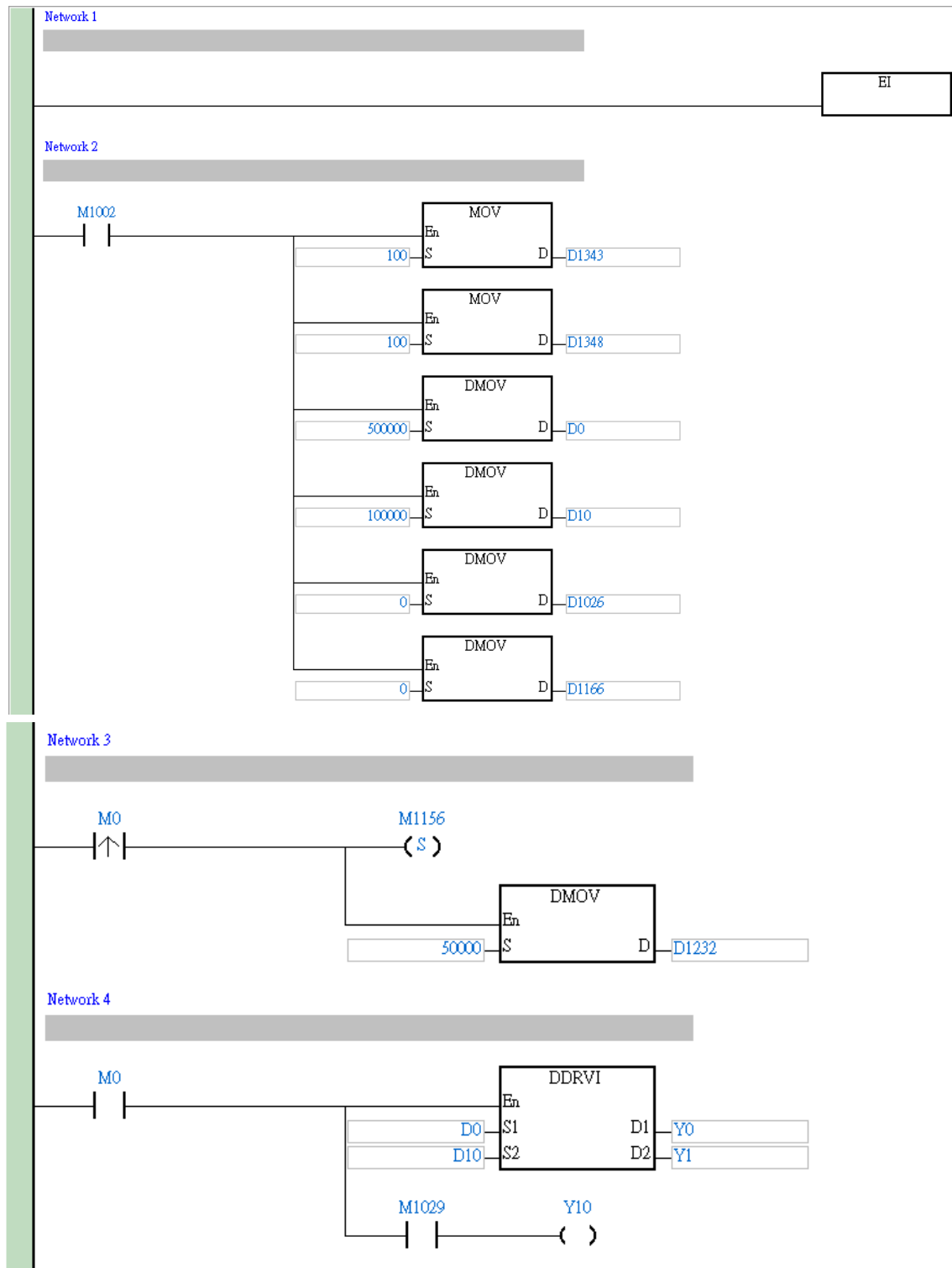
Device	Description
D0	The value in D0 indicates the number of output pulses specified for DDRVI.
D10	The value in D10 indicates the pulse output frequency specified for DDRVI.
D100	The value in D100 indicates the number of times an external interrupt is executed.
D1026	The value in D1026 indicates the number of closing pulses for the front masking of CH0. If M1156 is ON, and the value in D1026 is less than or equal to 0, the front masking function will not be enabled.
D1166	The value in D1166 indicates the number of starting pulses for the interrupt area of CH0. If M1156 is ON, and the value in D1166 is less than or equal to 0, the back masking function will not be enabled.
D1232	The value in D1232 indicates the number of deceleration pulses after marking for CH0.
D1343	The value in D1343 indicates the acceleration time for CH0. (Unit: ms)
D1348	The value in D1348 indicates the deceleration time for CH0. (Unit: ms)
I001	I001 is executed when the input signal sent to X0 goes from low to high.
M0	M0 is used to enable DDRVI.
M1156	M1156 is used to enable the function of stopping CH0 from outputting pulses when an interrupt occurs.
Y0	Y0 is the pulse output device specified for DDRVI. It is used to drive the servo.
Y1	Direction switching output device specified for DDRVI
Y10	Y10 is used to trigger the sealing of a bag and the cutting of the cutting knife.

【WPLSoft program】



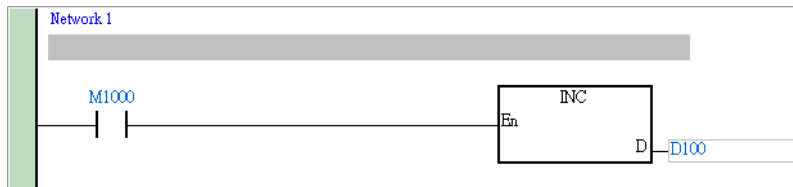
【ISPSOft program】

Cyclic POU:



External interrupt: X0

Interrupt service routine: I001



【 Control description 】

- Write 100 to D1343 and D1348, and write 50000 to (D1232, D1233).
- The pulse output frequency specified for DDRVI is 100 kHz, and the number of output pulses specified for DDRVI is 500000.
- If M0 is turned from OFF to ON, Y0 will begin to output pulses to the servo, and the servo will convey bags. If the sensor detects the mark on a bag, X0 will be used to trigger the execution of the interrupt service routine I001, and the servo will immediately decelerate and output 50000 pulses. After the servo stops, the stop flag M1538 and the completion flag M1029 will be ON. The value in D100 indicates the number of times the interrupt service routine I001 is executed.
- If M1029 is ON, Y10 will be used to trigger the cutting of the cutting knife.

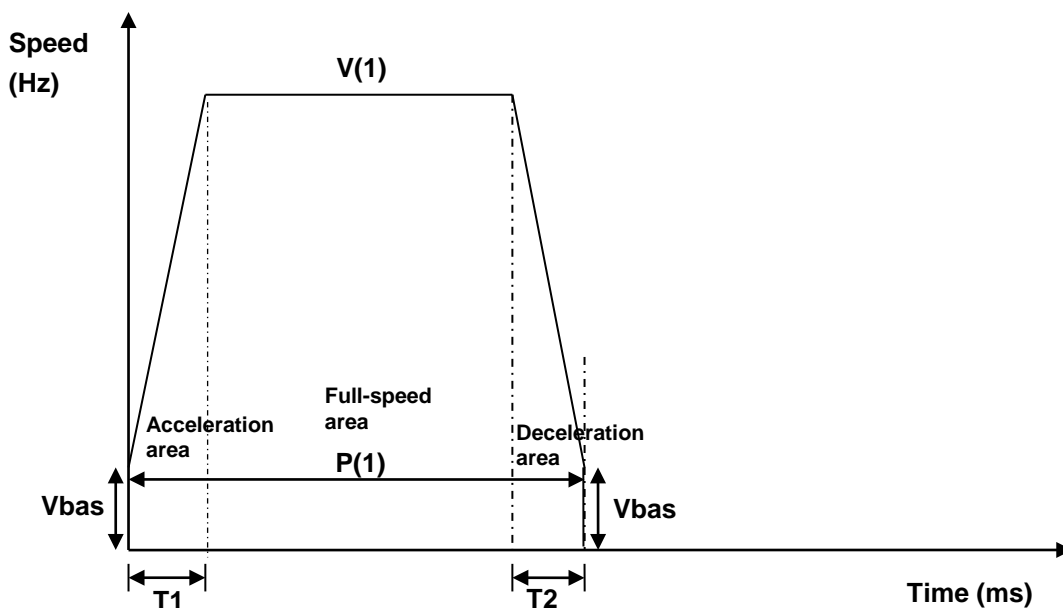
【 Single-speed marking in the acceleration/deceleration/full-speed area 】

Description:

The area before V(1) is an acceleration area.

V(1) is a full-speed area.

The area after V(1) is a deceleration area.



Vbase	T1	T2	P(1)	V(1)
Starting frequency	Acceleration time	Deceleration time	Position of the first speed	First speed

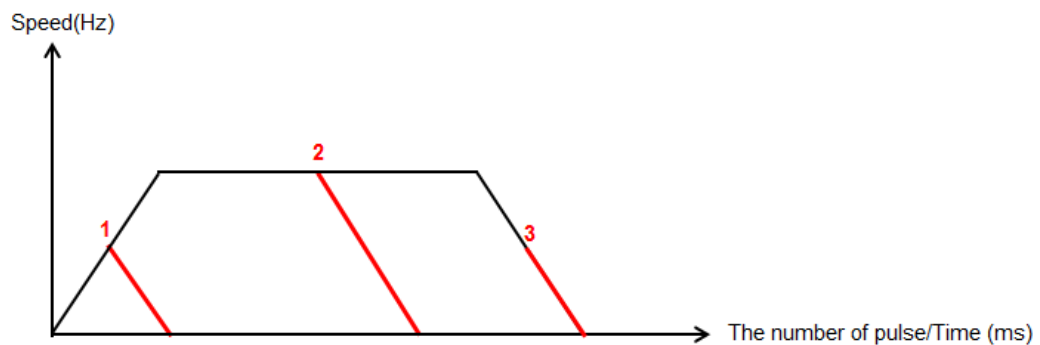
Suppose the starting frequency of CH0 is 0 Hz.

- The value in (D1232, D1233) is 0.

If marking occurs in the acceleration area, it will decrease and stop. Please see red line 1.

If marking occurs in the full-speed area, it will decrease and stop immediately. Please see red line 2.

If marking occurs in the deceleration area, it will keep decreasing. Please see red line 3.



- The value in (D1232, D1233) is greater than the value in (D1133, D1134).

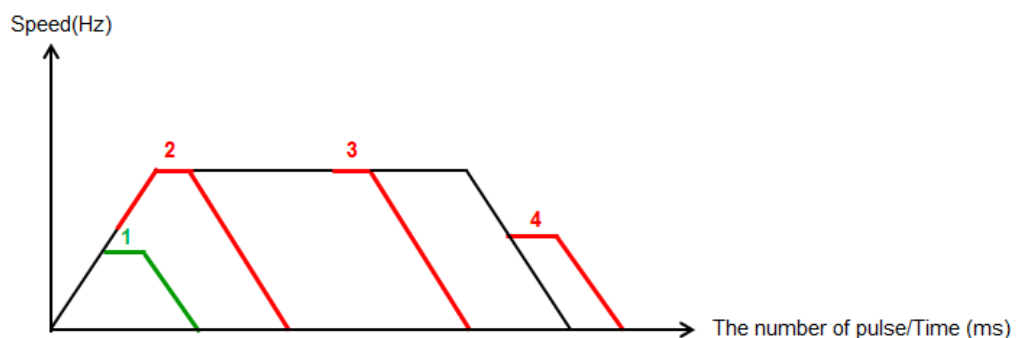
If marking occurs in the acceleration area, there will be two situations.

The number of deceleration pulses is not sufficient to accomplish the full speed (Value in (D1232, D1233) < Value in (D1127, D1128) + Value in (D1133, D1134)). Please see green line 1.

The number of deceleration pulses is sufficient to accomplish the full speed (Value in (D1232, D1233) > Value in (D1127, D1128) + Value in (D1133, D1134)). Please see red line 2.

If marking occurs in the full-speed area, it will decrease according to the value in (D1133, D1134). Please see red line 3.

If marking occurs in the deceleration area, it will decrease according to the value in (D1133, D1134). Please see red line 4.

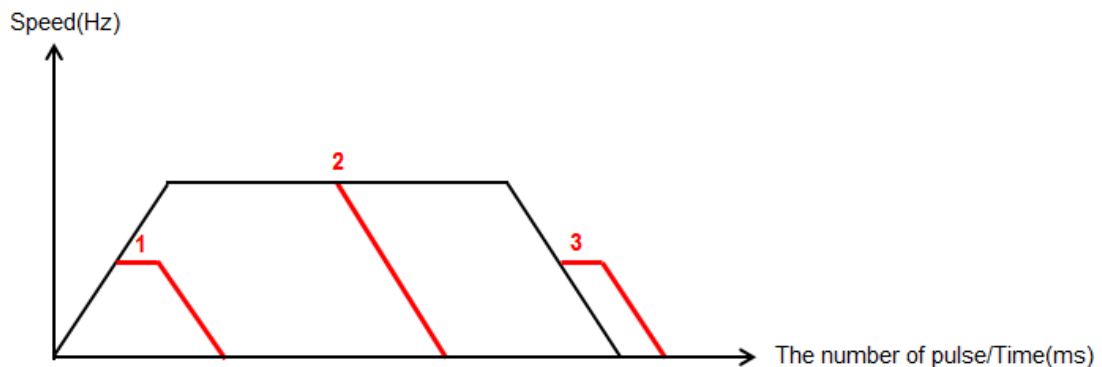


- The value in (D1232, D1233) is equal to the value in (D1133, D1134).

If marking occurs in the acceleration area, it will decrease according to the value in (D1133, D1134). Please see red line 1.

If marking occurs in the full-speed area, it will decrease according to the value in (D1133, D1134). Please see red line 2.

If marking occurs in the deceleration area, it will decrease according to the value in (D1133, D1134). Please see red line 3.



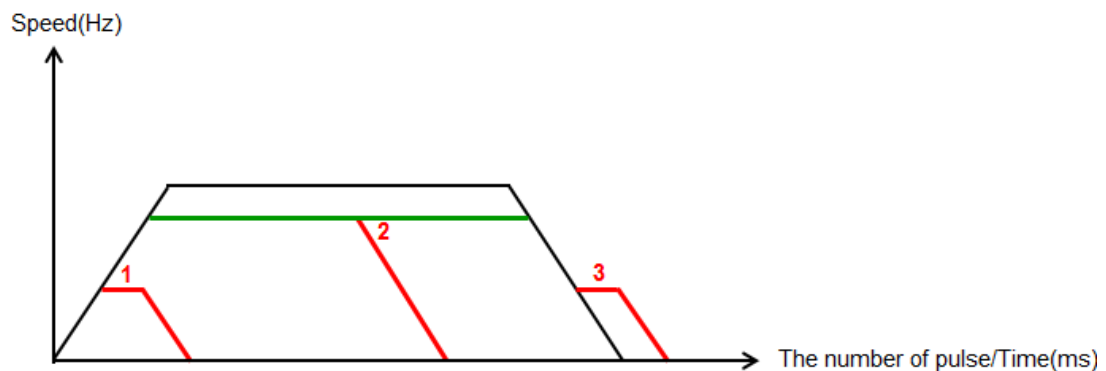
- The value in (D1232, D1233) is less than the value in (D1133, D1134).

The full output frequency is limited, and the firmware makes the value in (D1133, D1134) slightly greater than the value in ((D1232, D1233)). Please see the green line below.

If marking occurs in the acceleration area, it will decrease according to the value in (D1133, D1134). Please see red line 1.

If marking occurs in the full-speed area, it will decrease according to the value in (D1133, D1134). Please see red line 2.

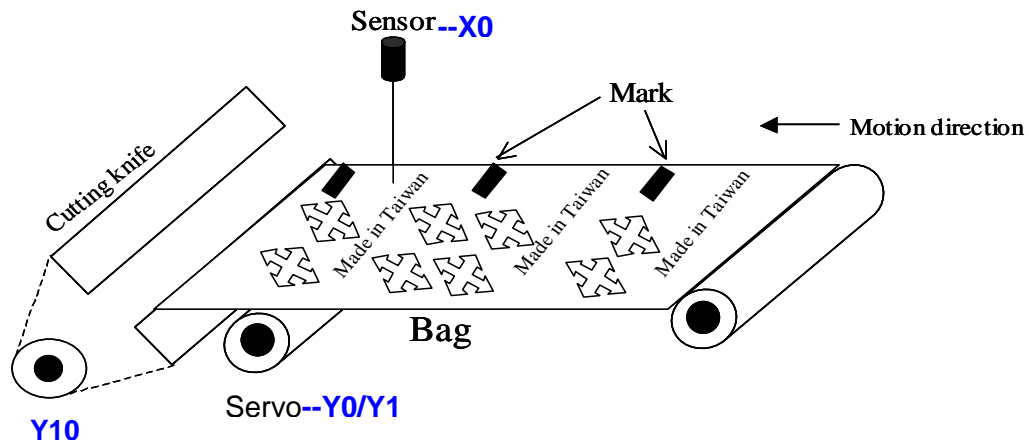
If marking occurs in the deceleration area, it will decrease according to the value in (D1133, D1134). Please see red line 3.



5 Single-speed Front/Back Masking Function and Marking Function—Bag Making Machine (Bags with Patterns)

5.1 DVP-EH3 Series PLC

【Mechanism diagram】



【Control requirement】

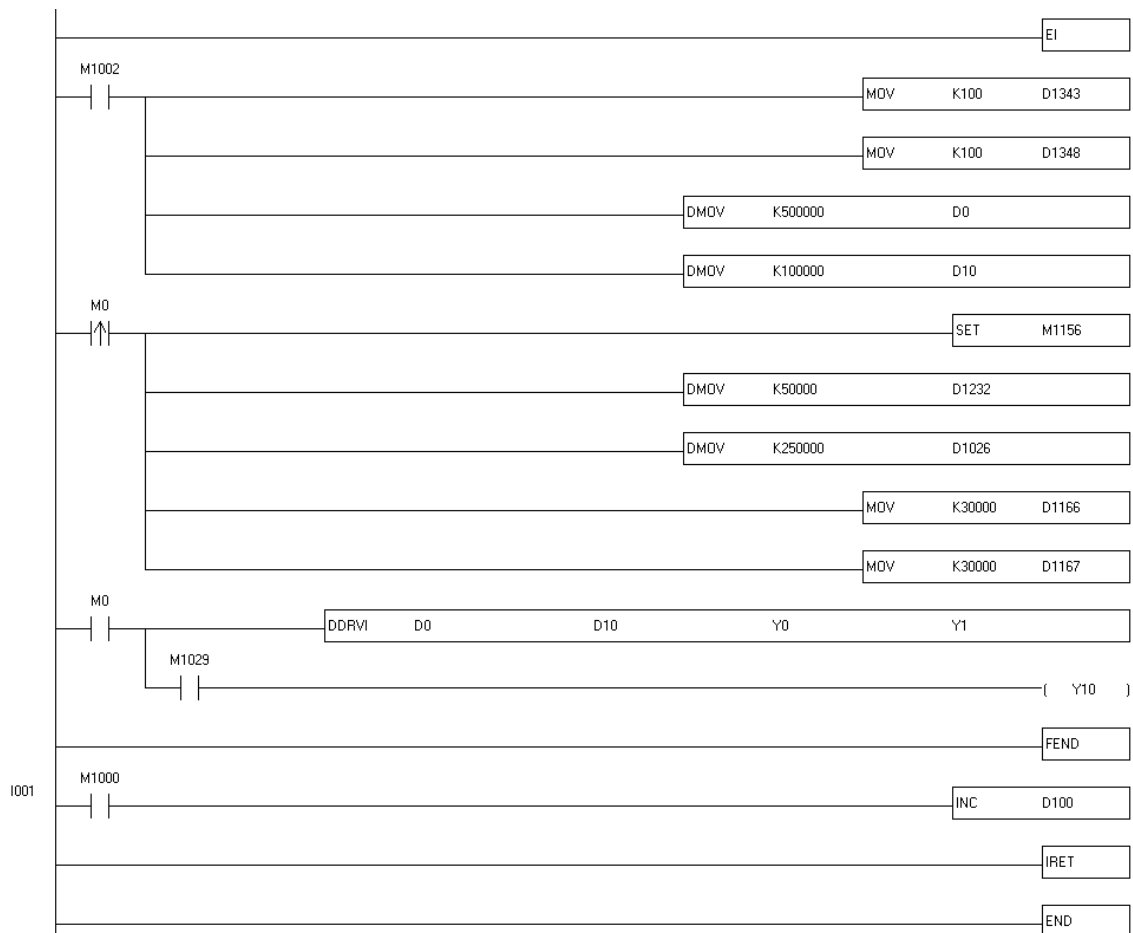
The instruction DDRVI is used to drive the servo which conveys bags. Bags are cut by means of the masking function and the marking function. (Owing to the fact that there are patterns on the bags on the bag making machine, the masking function is used to prevent the sensor from detecting the patterns.) If the sensor detects the mark on a bag when the number of output pulses is in the range of 220001 to 279999, the servo will immediately decelerates and outputs 50000 pulses. When the servo stops, the cutting knife cuts the bag. (A DVP-EH3 series PLC is used in this example.)

【Device description】

Device	Description
D0	The value in D0 indicates the number of output pulses specified for DDRVI.
D10	The value in D10 indicates the pulse output frequency specified for DDRVI.
D100	The value in D100 indicates the number of times an external interrupt is executed.
D1026	The value in D1026 indicates the number of closing pulses for the front masking of CH0. If M1156 is ON, and the value in D1026 is less than or equal to 0, the front masking function will not be enabled.
D1166	The value in D1166 indicates the number of starting pulses for the interrupt area of CH0. If M1156 is ON, and the value in D1166 is less than or equal to 0, the back masking function will not be enabled.
D1167	The value in D1167 indicates the number of pulses for the interrupt area of CH0. If M1156 is ON, and the value in D1167 is less than or equal to 0, the back masking function will not be enabled.
D1232	The value in D1232 indicates the number of deceleration pulses after marking for CH0.
D1343	The value in D1343 indicates the acceleration time for CH0. (Unit: ms)
D1348	The value in D1348 indicates the deceleration time for CH0. (Unit: ms)
I001	I001 is executed when the input signal sent to X0 goes from low to high.
M0	M0 is used to enable DDRVI.
M1156	M1156 is used to enable the function of stopping CH0 from outputting pulses when an interrupt occurs.

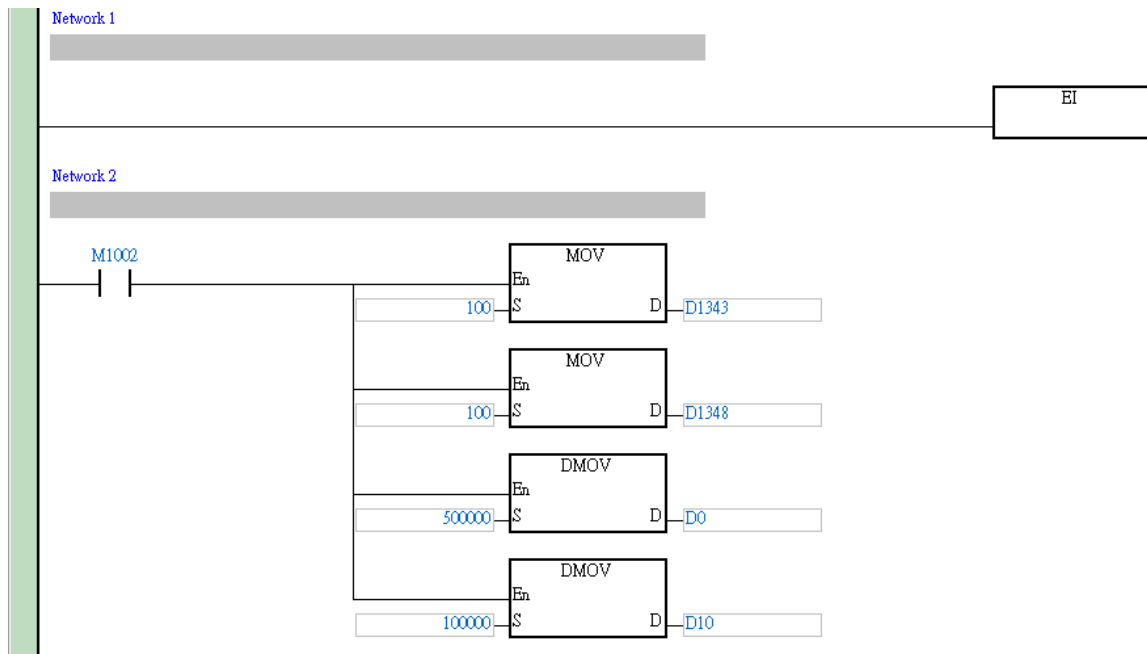
Device	Description
Y0	Y0 is the pulse output device specified for DDRVI. It is used to drive the servo.
Y1	Direction switching output device specified for DDRVI
Y10	Y10 is used to trigger the sealing of a bag, and the cutting of the cutting knife.

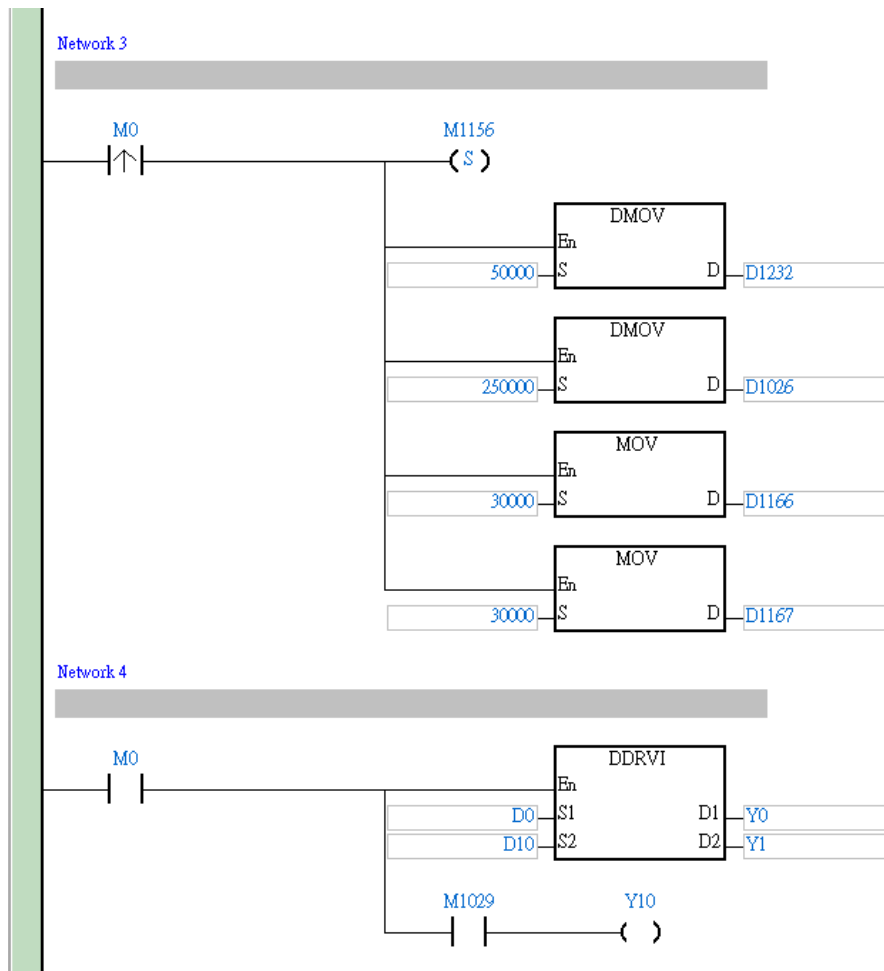
【 WPLSoft program 】



【ISPSoft program】

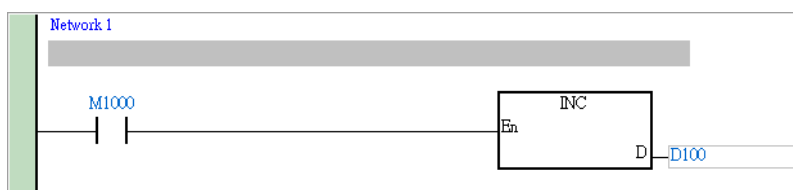
Cyclic POU:





External interrupt: X0

Interrupt service routine: I001



【Control description】

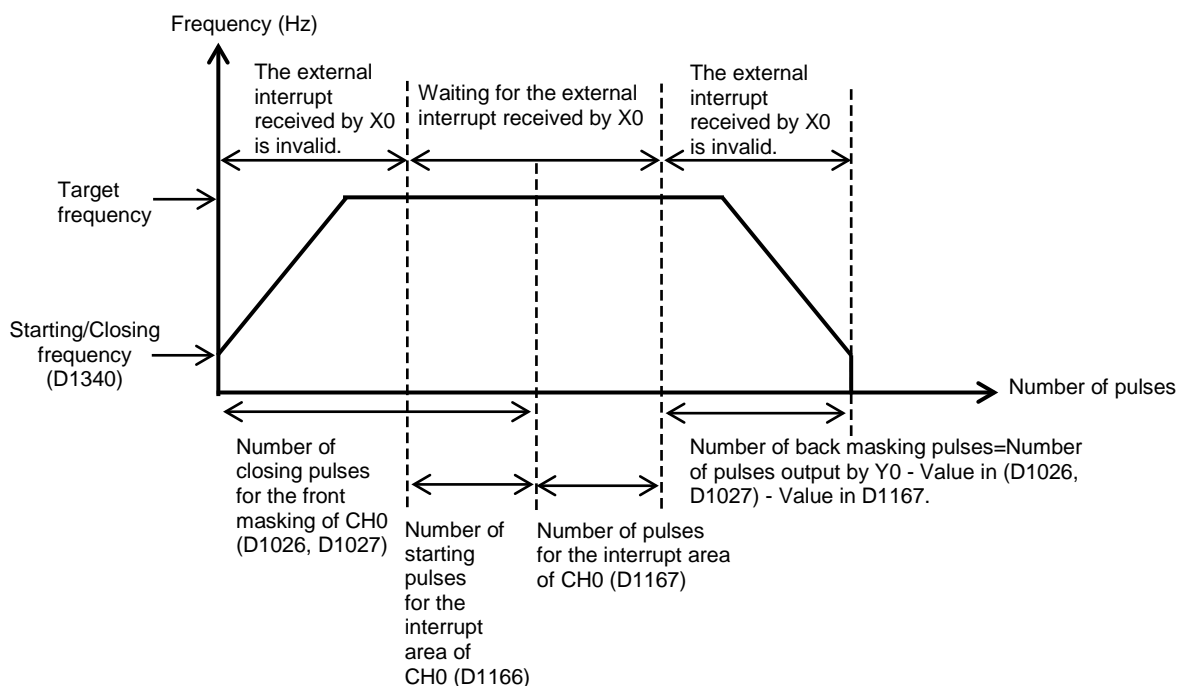
- Write 100 to D1343 and D1348, write 50000 to (D1232, D1233), write 250000 to (D1026, D1027), write 30000 to D1166, and write 30000 to D1167.
- The pulse output frequency specified for DDRVI is 100 kHz, and the number of output pulses specified for DDRVI is 500000.
- If M0 is turned from OFF to ON, Y0 will begin to output pulses to the servo, and the servo will convey bags. If the sensor detects the mark on a bag when the number of pulses output by Y0 is in the range of 220001 to 279999, X0 will be used to trigger the execution of the interrupt service routine I001, Y0 will immediately decelerates and outputs

50000 pulses. After the servo stops, the stop flag M1538 and the completion flag M1029 will be ON. The value in D100 indicates the number of times the interrupt service routine I001 is executed.

- If M1029 is ON, Y10 will be used to trigger the cutting of the cutting knife.
- If the sensor detects the mark on a bag when the number of pulses output by Y0 is less than or equal to 220000, or greater than or equal to 280000, X0 will be used to trigger the execution of the interrupt service routine I001, and Y0 will not decelerate.

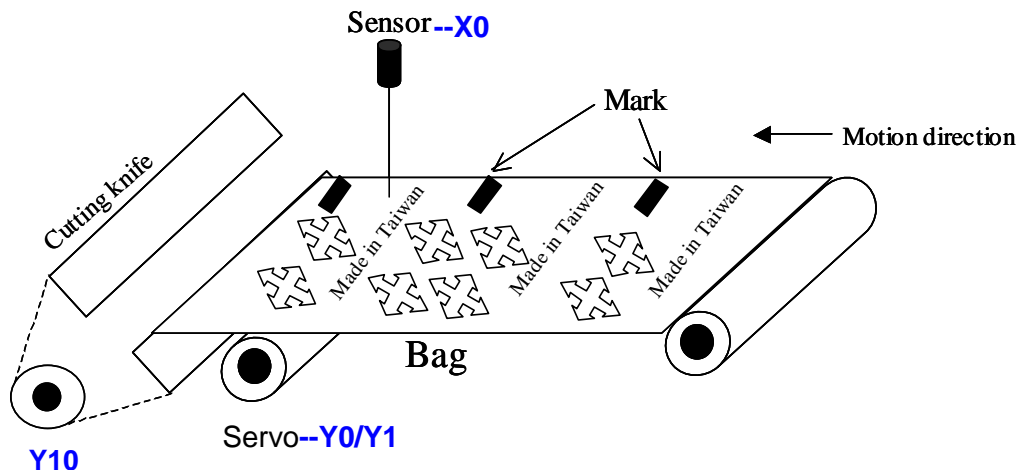
【Front/Back masking function of CH0】

- The number of closing pulses for the front masking of CH0 includes the number of starting pulses for the interrupt area of CH0. The value in D1167 indicates the number of pulses for the interrupt area of CH0. The area in which an interrupt is allowed to occur is in the range of (D1026, D1027)-D1166 to (D1026, D1027)+D1167.
- Example: The value in (D1026, D1027) is 250000, the value in D1166 is 30000, and the value in D1167 is 30000. The area in which an interrupt is allowed to occur is in the range of 220001 to 279999. If the number of pulses output by Y0 is less than or equal to 220000, or greater than or equal to 280000, no interrupt will be valid.
- The number of back masking pulses is equal to the number of pulses output by Y0 minus the value in (D1026, D1027) minus the value in D1167.



5.2 DVP-ES2 Series PLC

【Mechanism diagram】



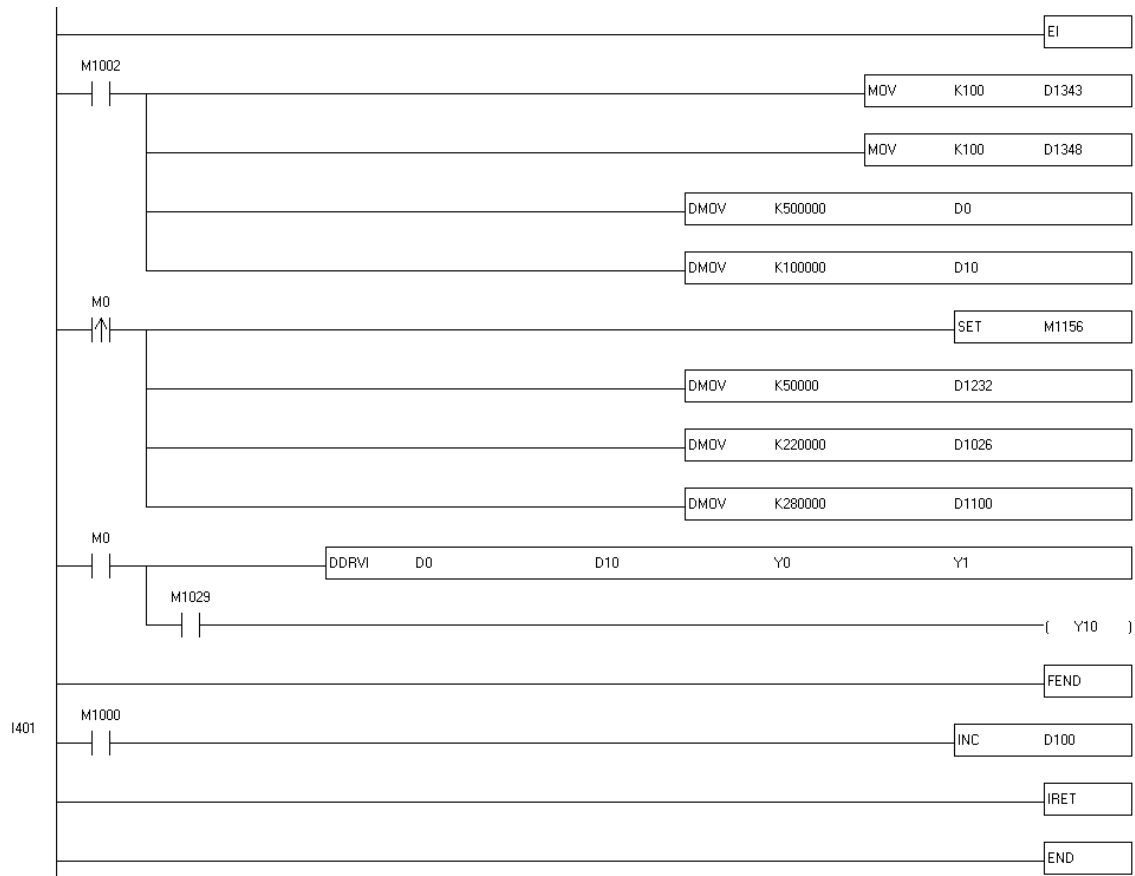
【Control requirement】

The instruction DDRVI is used to drive the servo which conveys bags. Bags are cut by means of the masking function and the marking function. (Owing to the fact that there are patterns on the bags on the bag making machine, the masking function is used to prevent the sensor from detecting the patterns.) If the sensor detects the mark on a bag when the number of output pulses is in the range of 220001 to 279999, the servo will immediately decelerates and outputs 50000 pulses. When the servo stops, the cutting knife cuts the bag. (A DVP-ES2 series PLC is used in this example.)

【Device description】

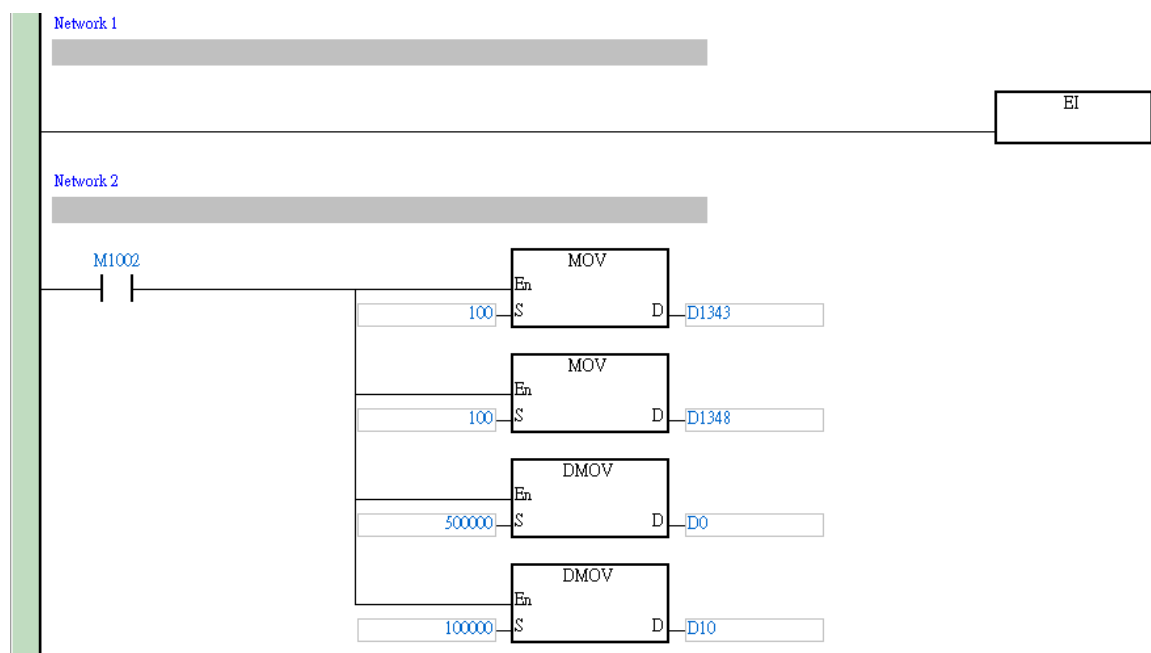
Device	Description
D0	The value in D0 indicates the number of output pulses specified for DDRVI.
D10	The value in D10 indicates the pulse output frequency specified for DDRVI.
D100	The value in D100 indicates the number of times an external interrupt is executed.
D1026	The value in D1026 indicates the number of closing pulses for the front masking of CH0. If M1156 is ON, and the value in D1026 is less than or equal to 0, the front masking function will not be enabled.
D1100	The value in D1100 indicates the number of starting pulses for the back masking of CH0. If M1156 is ON, and the value in D1100 is less than or equal to 0, the back masking function will not be enabled.
D1232	The value in D1232 indicates the number of deceleration pulses after marking for CH0.
D1343	The value in D1343 indicates the acceleration time for CH0. (Unit: ms)
D1348	The value in D1348 indicates the deceleration time for CH0. (Unit: ms)
I401	I401 is executed when the input signal sent to X4 goes from low to high.
M0	M0 is used to enable DDRVI.
M1156	M1156 is used to enable the function of stopping CH0 from outputting pulses when an interrupt occurs.
Y0	Y0 is the pulse output device specified for DDRVI. It is used to drive the servo.
Y1	Direction switching output device specified for DDRVI
Y10	Y10 is used to trigger the sealing of a bag, and the cutting of the cutting knife.

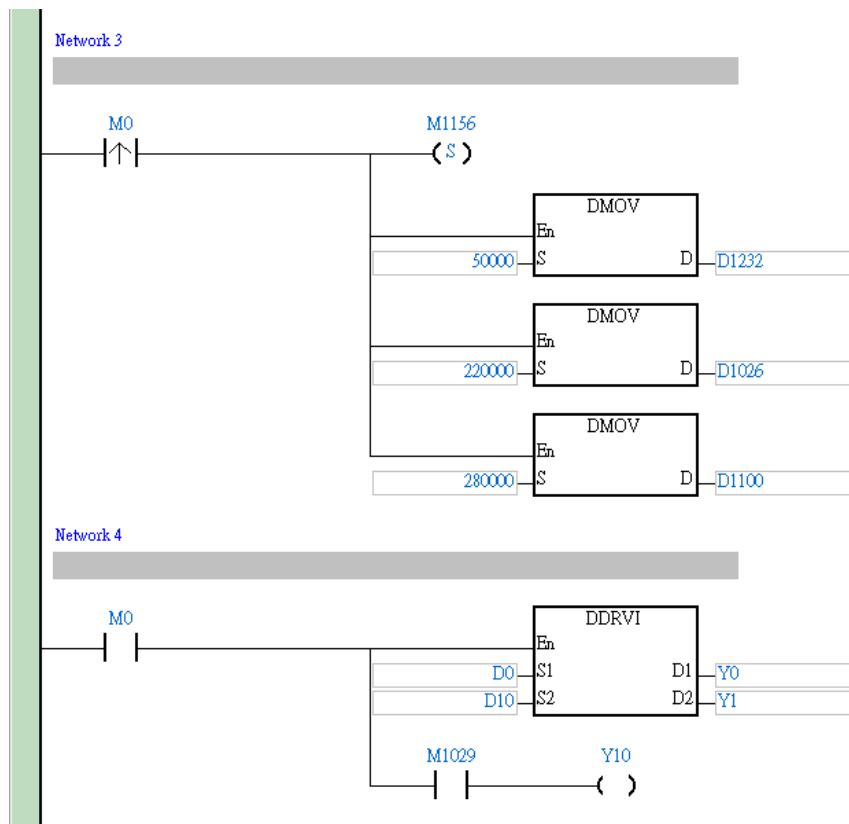
【WPLSoft program】



【ISPSOft program】

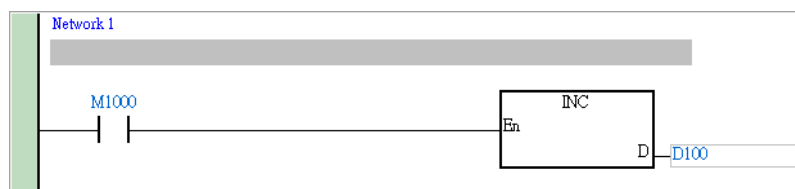
Cyclic POU:





External interrupt: X4

Interrupt service routine: I401

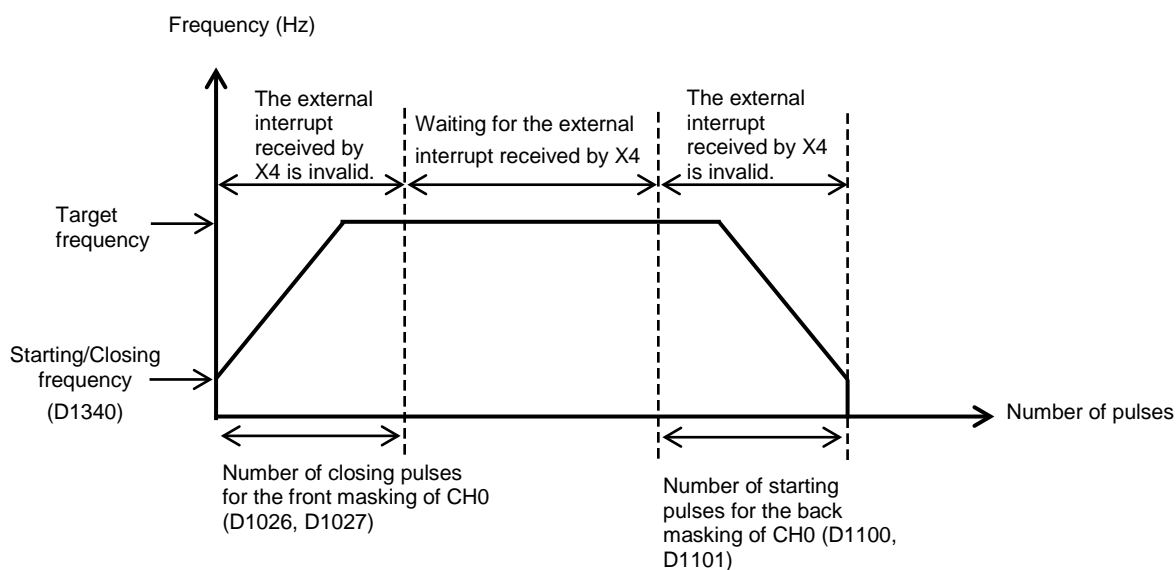


【Control description】

- Write 100 to D1343 and D1348, write 50000 to (D1232, D1233), write 220000 to (D1026, D1027), write 30000 to D1166, and write 280000 to D1100.
- The pulse output frequency specified for DDRVI is 100 kHz, and the number of output pulses specified for DDRVI is 500000.
- If M0 is turned from OFF to ON, Y0 will begin to output pulses to the servo, and the servo will convey bags. If the sensor detects the mark on a bag when the number of pulses output by Y0 is in the range of 220001 to 279999, X04 will be used to trigger the execution of the interrupt service routine I401, Y0 will immediately decelerates and outputs 50000 pulses. After the servo stops, the stop flag M1538 and the completion flag M1029 will be ON. The value in D100 indicates the number of times the interrupt service routine I001 is executed.
- If M1029 is ON, Y10 will be used to trigger the cutting of the cutting knife.
- If the sensor detects the mark on a bag when the number of pulses output by Y0 is less than or equal to 220000, or greater than or equal to 280000, X4 will be used to trigger the execution of the interrupt service routine I401, and Y0 will not decelerate.

【Front/Back masking function of CH0】

- The value in (D1026, D1027) indicates the number of closing pulses for the front masking of CH0, and the value in (D1100, D1101) indicates the number of starting pulses for the back masking of CH0.
- Example: The value in (D1026, D1027) is 220000, and the value in (D1100, D1101) is 280000. The area in which an interrupts is allowed to occur is in the range of 220001 to 279999. If the number of pulses output by Y0 is less than or equal to 220000, or greater than or equal to 280000, no interrupt will be valid.



6 Two-speed Marking Function

6.1 First Speed>Second Speed

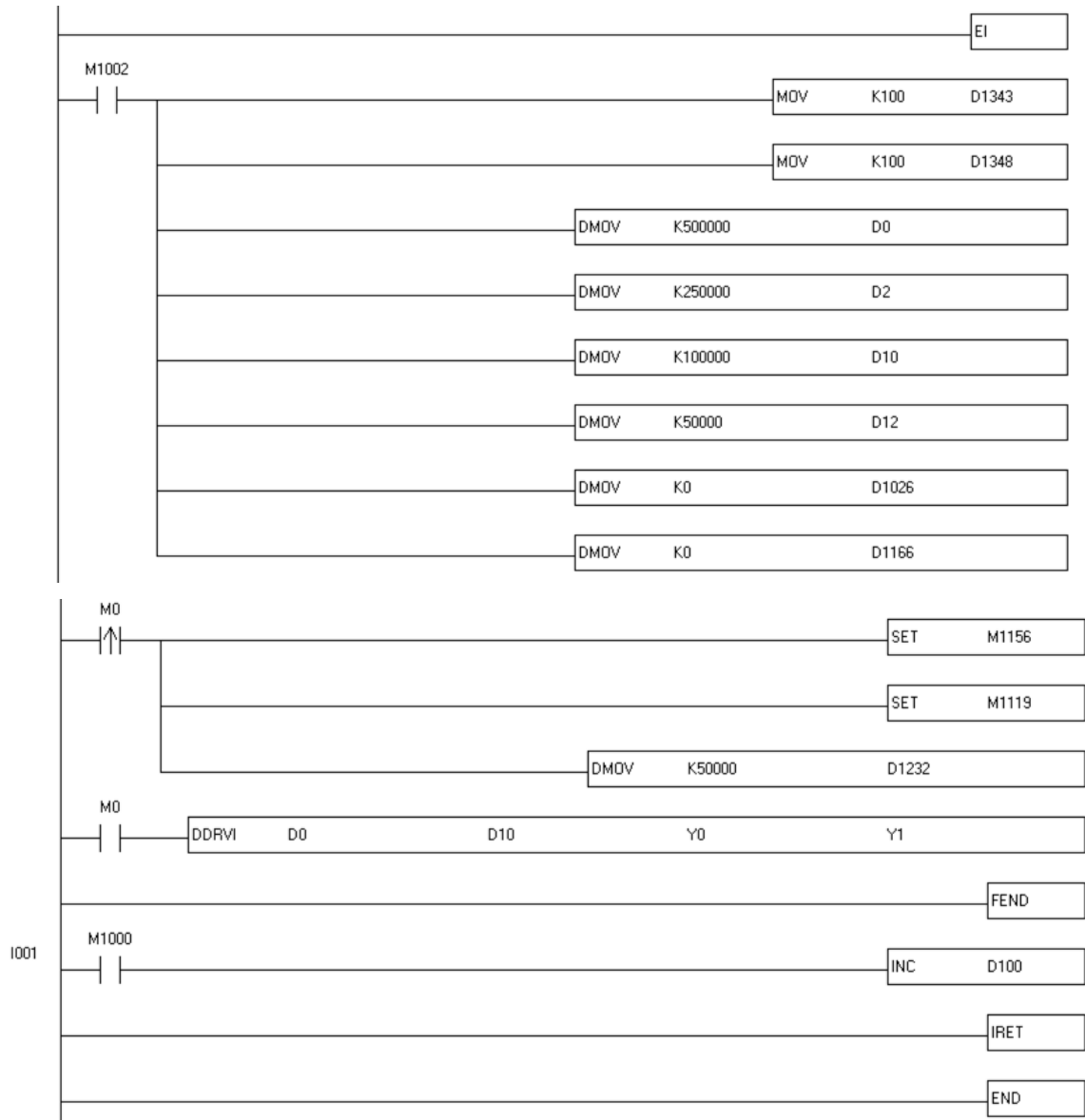
【Control requirement】

The first speed is greater than the second speed. During the execution of the instruction DDRVI, if the external input interrupt received by X0 occurs at the first speed or the second speed, Y0 will decelerate, output 50000 pulses and stop. (A DVP-EH3 series PLC is used in this example.)

【Device description】

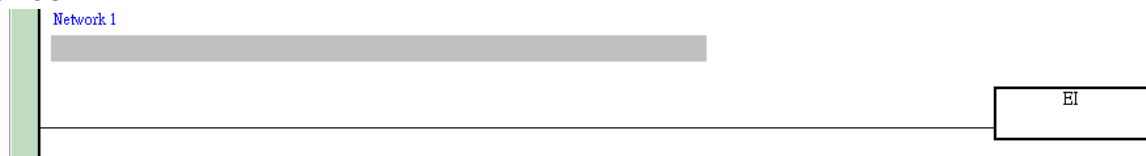
Device	Description
D0	The value in D0 indicates the number of output pulses of the first speed specified for DDRVI.
D2	The value in D2 indicates the number of output pulses of the second speed specified for DDRVI.
D10	The value in D10 indicates the pulse output frequency of the first speed specified for DDRVI.
D12	The value in D10 indicates the pulse output frequency of the second speed specified for DDRVI.
D100	The value in D100 indicates the number of times an external interrupts service routine is executed.
D1166	The value in D1166 indicates the number of starting pulses for the interrupt area of CH0. If M1156 is ON, and the value in D1166 is less than or equal to 0, the back masking function will not be enabled.
D1167	The value in D1167 indicates the number of pulses for the interrupt area of CH0. If M1156 is ON, and the value in D1167 is less than or equal to 0, the back masking function will not be enabled.
D1232	The value in D1232 indicates the number of deceleration pulses after marking for CH0.
D1343	The value in D1343 indicates the acceleration time for CH0. (Unit: ms)
D1348	The value in D1348 indicates the deceleration time for CH0. (Unit: ms)
I001	I001 is executed when the input signal sent to X0 goes from low to high.
M0	M0 is used to enable DDRVI.
M1119	Using DDRVI/DDRVA to output two target frequencies.
M1156	M1156 is used to enable the function of stopping CH0 from outputting pulses when an interrupt occurs.
Y0	Pulse output device specified for DDRVI
Y1	Direction switching output device specified for DDRVI

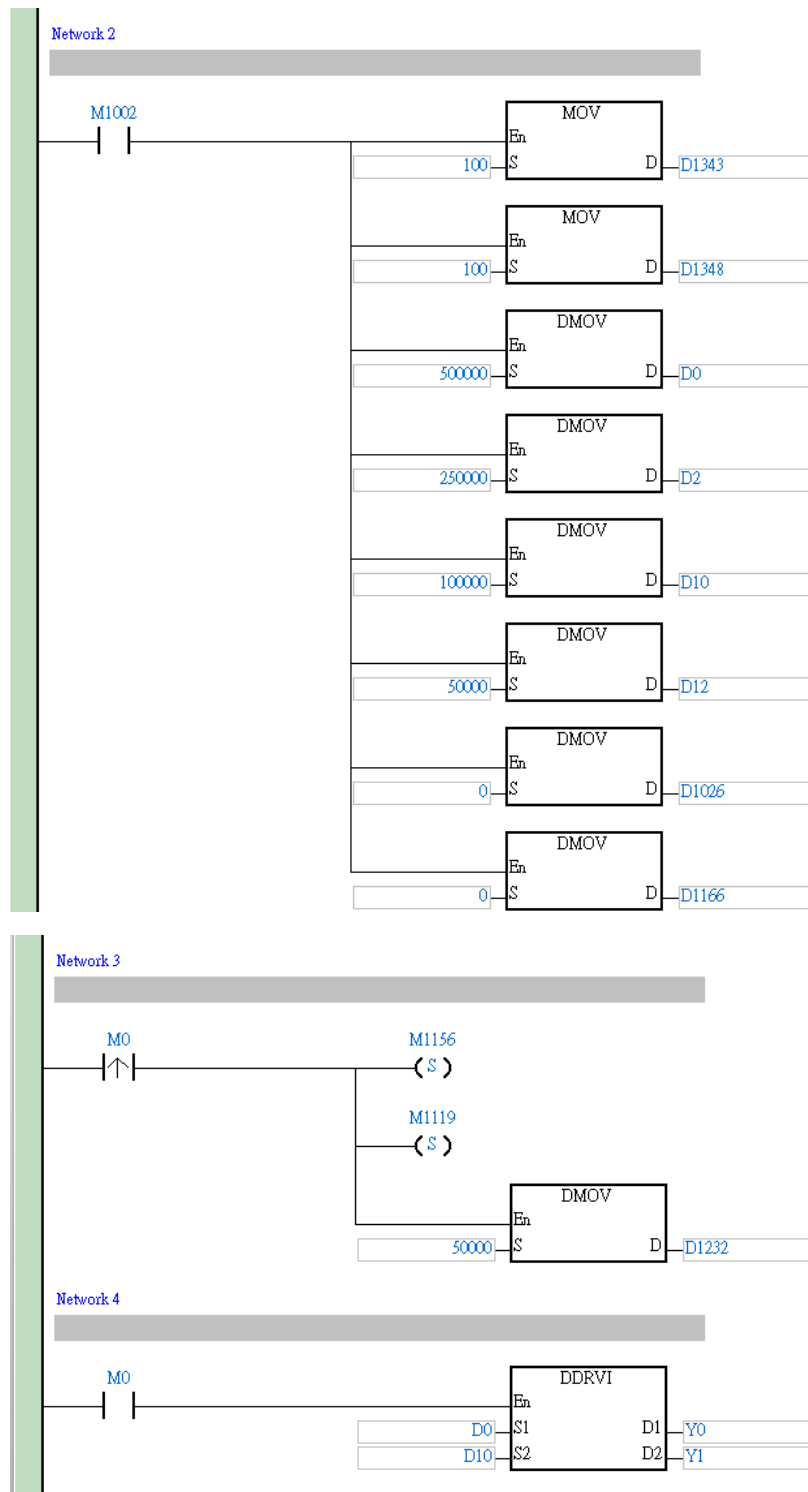
【WPLSoft program】



【ISPSOft program】

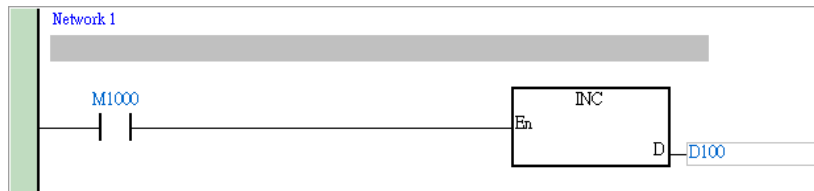
Cyclic POU:





External interrupt: X0

Interrupt service routine: I001



【 Control description 】

- Write 100 to D1343 and D1348, write 50000 to (D1232, D1233), and write 0 to (D1026, D1027) and D1166.
- The pulse output frequency of the first speed specified for DDRVI is 100 kHz, and the number of output pulses of the first speed specified for DDRVI is 500000. The pulse output frequency of the second speed specified for DDRVI is 50 kHz, and the number of output pulses of the second speed specified for DDRVI is 250000.
- If M0 is turned from OFF to ON, Y0 will begin to output pulses.
- If the external input interrupt received by X0 occurs in the first full-speed area or the second full-speed area, Y0 will decelerate and output 50000 pulses. After Y0 stops, the stop flag M1538 and the completion flag M1029 will be ON. The value in D100 indicates the number of times the interrupt service routine I001 is executed.
- When M1538 is ON, users can reset M1156. After M1156 is reset, the PLC will begin to output the remaining pulses. After the target number of pulses is reached, M1029 will be ON.
- If the external input interrupt received by X0 occurs in the deceleration area, Y0 will decelerate and output 50000 pulses. After Y0 stops, the stop flag M1538 will not be ON.

【 Two-speed marking in the acceleration/deceleration/full-speed area 】

Description:

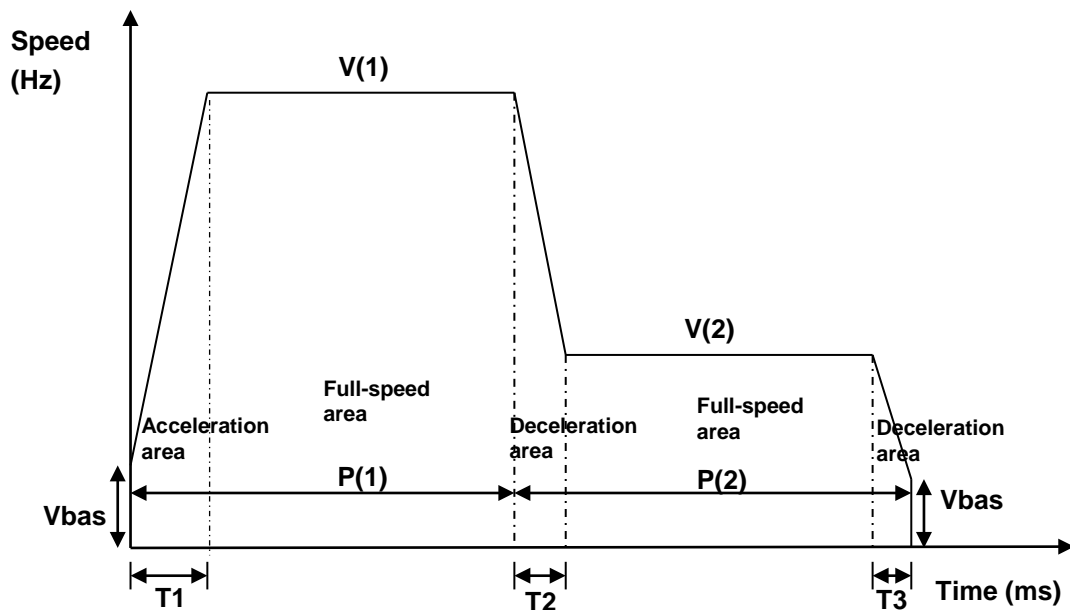
The area before V(1) is an acceleration area.

V(1) is the first full-speed area.

The area after V(1) is a deceleration area.

V(2) is the second full-speed area.

The area after V(2) is a deceleration area.



Vbase	T1	T2+T3	P(1)	V(1)	P(2)	V(2)
Starting frequency	Acceleration time	Deceleration time	Position of the first speed	First speed	Position of the second speed	Second speed

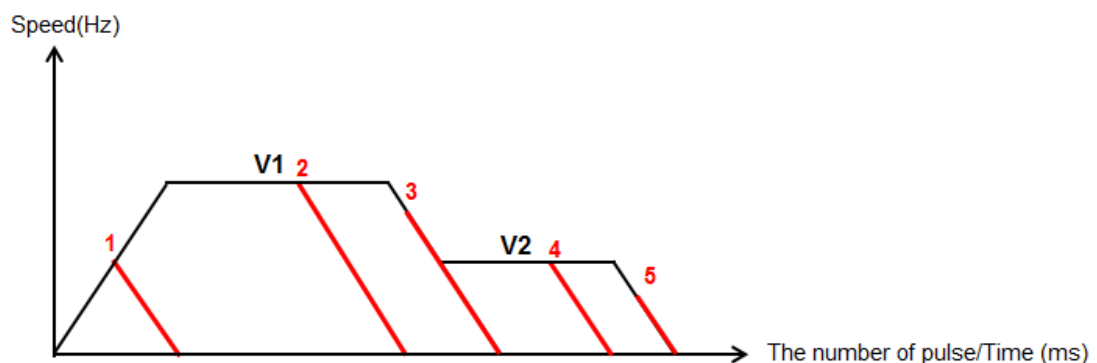
Suppose the starting frequency of CH0 is 0 Hz.

- The value in (D1232, D1233) is 0 or less than the value in (D1133, D1134).

If marking occurs in the acceleration area, it will decrease and stop. Please see red line 1.

If marking occurs in the full-speed area, it will decrease and stop immediately. Please see red line 2 and red line 4.

If marking occurs in the deceleration area, it will keep decreasing. Please see red line 3 and red line 5.



- The value in (D1232, D1233) is greater than the value in (D1133, D1134).

If marking occurs in the acceleration area, there will be two situations.

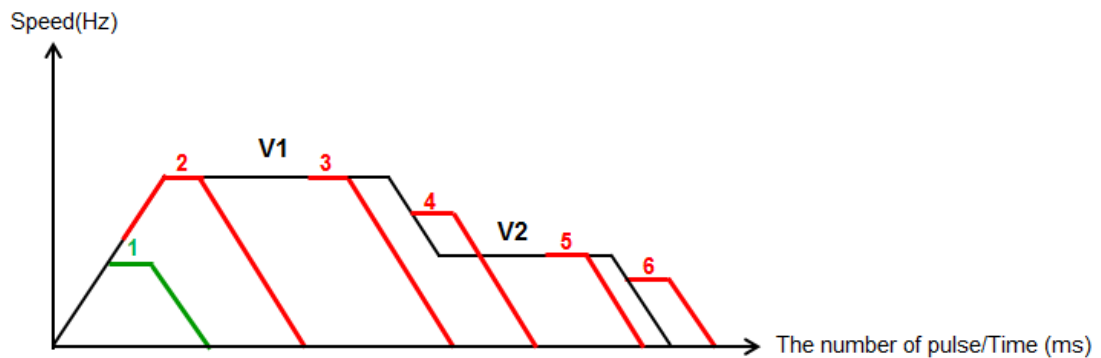
The number of deceleration pulses is not sufficient to accomplish the full speed (Value in (D1232, D1233) < Value in (D1127, D1128) + Value in (D1133, D1134)). Please see green line 1.

The number of deceleration pulses is sufficient to accomplish the full speed (Value in (D1232, D1233) > Value in

(D1127, D1128) + Value in (D1133, D1134)). Please see red line 2.

If marking occurs in the full-speed area, it will decrease according to the value in (D1133, D1134). Please see red line 3 and red line 5.

If marking occurs in the deceleration area, it will decrease according to the value in (D1133, D1134). Please see red line 4 and red line 6.

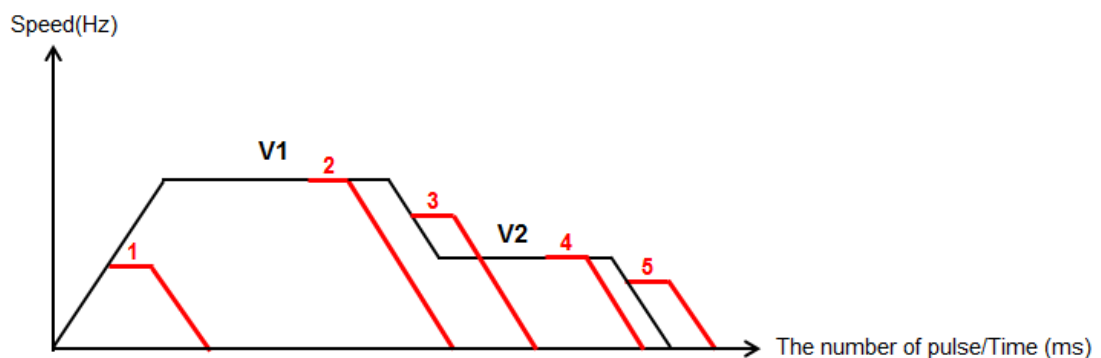


- The value in (D1232, D1233) is equal to the value in (D1133, D1134).

If marking occurs in the acceleration area, it will decrease according to the value in (D1133, D1134). Please see red line 1.

If marking occurs in the full-speed area, it will decrease according to the value in (D1133, D1134). Please see red line 2 and red line 4.

If marking occurs in the deceleration area, it will decrease according to the value in (D1133, D1134). Please see red line 3 and red line 5.



6.2 Second Speed > First Speed

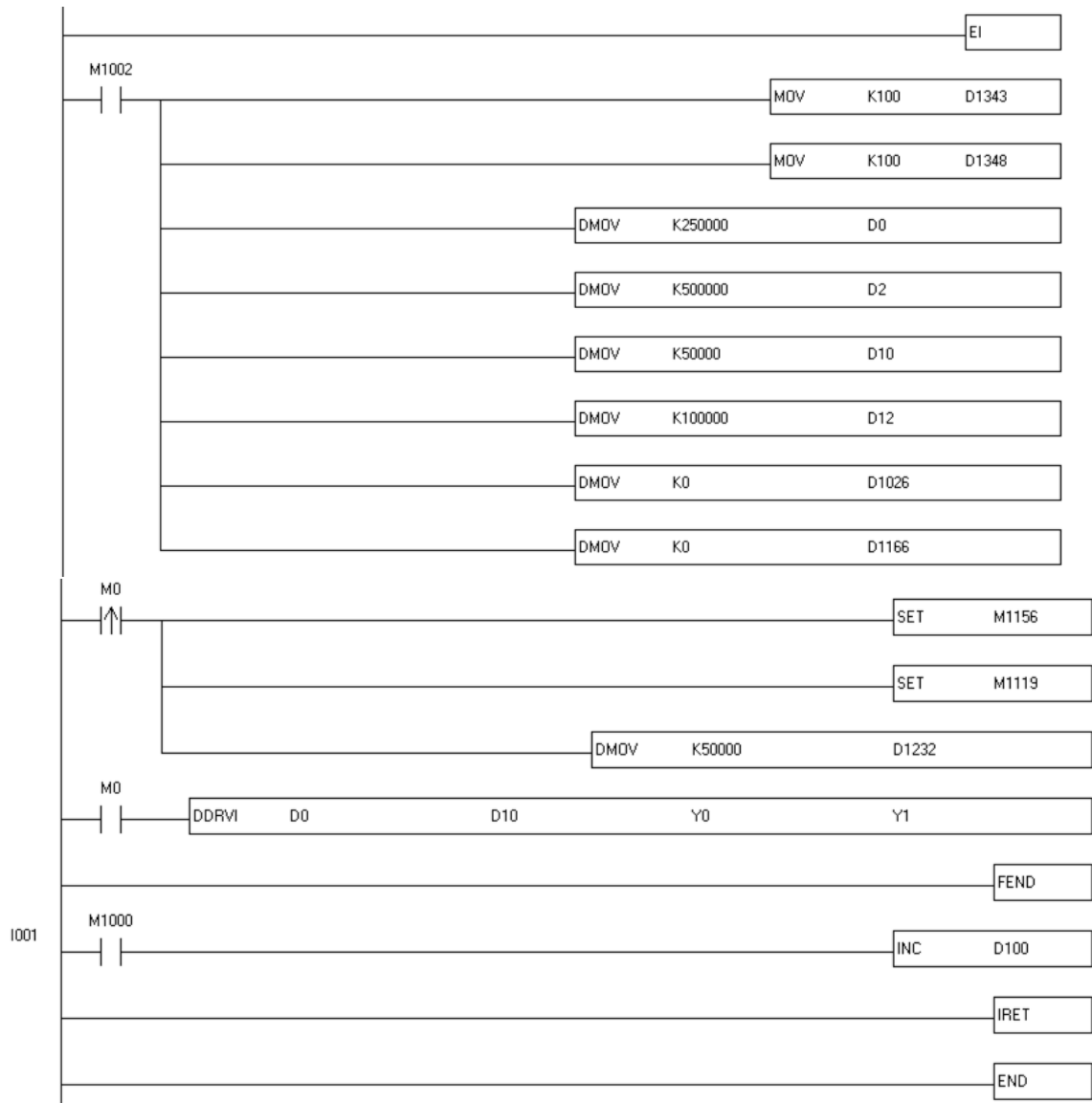
【Control requirement】

The second speed is greater than the first speed. During the execution of the instruction DDRVI, if the external input interrupt received by X0 occurs at the first speed or the second speed, Y0 will decelerate, output 50000 pulses and stop. (A DVP-EH3 series PLC is used in this example.)

【Device description】

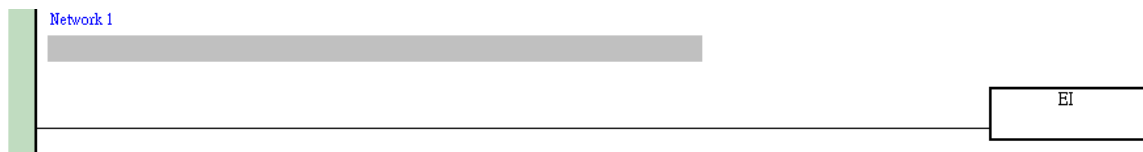
Device	Description
D0	The value in D0 indicates the number of output pulses of the first speed specified for DDRVI.
D2	The value in D2 indicates the number of output pulses of the second speed specified for DDRVI.
D10	The value in D10 indicates the pulse output frequency of the first speed specified for DDRVI.
D12	The value in D10 indicates the pulse output frequency of the second speed specified for DDRVI.
D100	The value in D100 indicates the number of times an external interrupts service routine is executed.
D1166	The value in D1166 indicates the number of starting pulses for the interrupt area of CH0. If M1156 is ON, and the value in D1166 is less than or equal to 0, the back masking function will not be enabled.
D1167	The value in D1167 indicates the number of pulses for the interrupt area of CH0. If M1156 is ON, and the value in D1167 is less than or equal to 0, the back masking function will not be enabled.
D1232	The value in D1232 indicates the number of deceleration pulses after marking for CH0.
D1343	The value in D1343 indicates the acceleration time for CH0. (Unit: ms)
D1348	The value in D1348 indicates the deceleration time for CH0. (Unit: ms)
I001	I001 is executed when the input signal sent to X0 goes from low to high.
M0	M0 is used to enable DDRVI.
M1119	Using DDRVI/DDRVA to output two target frequencies.
M1156	M1156 is used to enable the function of stopping CH0 from outputting pulses when an interrupt occurs.
Y0	Pulse output device specified for DDRVI
Y1	Direction switching output device specified for DDRVI

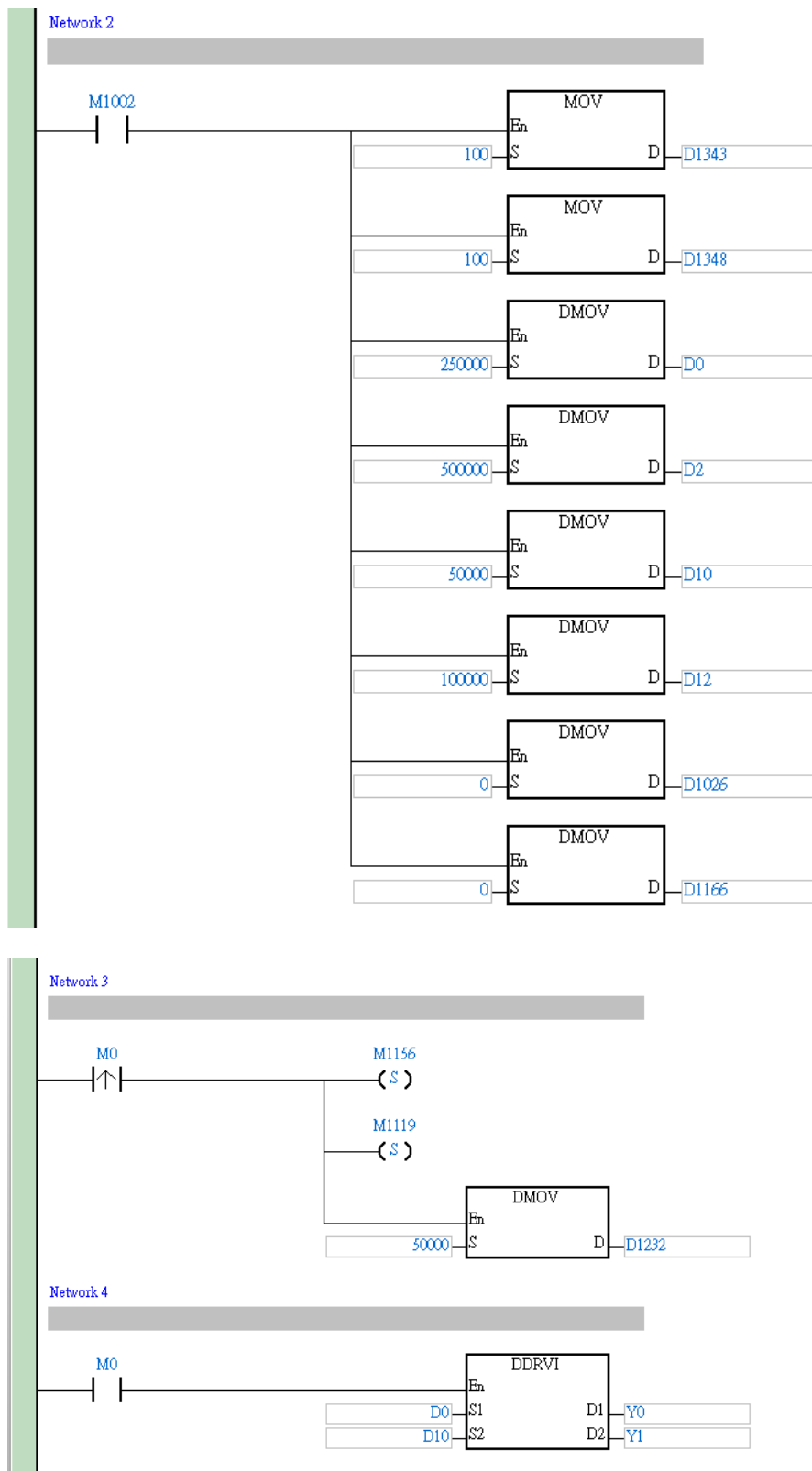
【WPLSoft program】



【ISPSOft program】

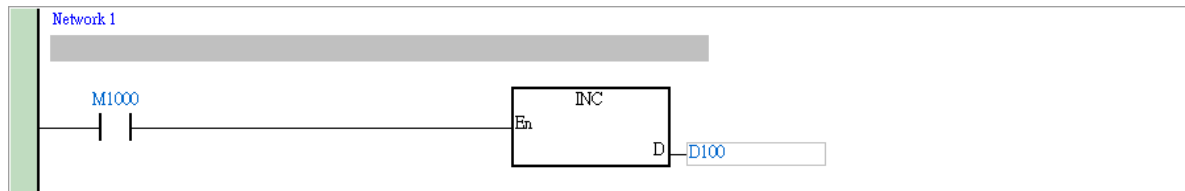
Cyclic POU:





External interrupt: X0

Interrupt service routine: I001



【Control description】

- Write 100 to D1343 and D1348, write 50000 to (D1232, D1233), and write 0 to (D1026, D1027) and D1166.
- The pulse output frequency of the first speed specified for DDRVI is 50 kHz, and the number of output pulses of the first speed specified for DDRVI is 250000. The pulse output frequency of the second speed specified for DDRVI is 100 kHz, and the number of output pulses of the second speed specified for DDRVI is 500000.
- If M0 is turned from OFF to ON, Y0 will begin to output pulses.
- If the external input interrupt received by X0 occurs in the first full-speed area or the second full-speed area, Y0 will decelerate and output 50000 pulses. After Y0 stops, the stop flag M1538 and the completion flag M1029 will be ON. The value in D100 indicates the number of times the interrupt service routine I001 is executed.
- When M1538 is ON, users can reset M1156. After M1156 is reset, the PLC will begin to output the remaining pulses. After the target number of pulses is reached, M1029 will be ON.
- If the external input interrupt received by X0 occurs in the deceleration area, Y0 will decelerate and output 50000 pulses. After Y0 stops, the stop flag M1538 will not be ON.

【Two-speed marking in the acceleration/deceleration/full-speed area】

Description:

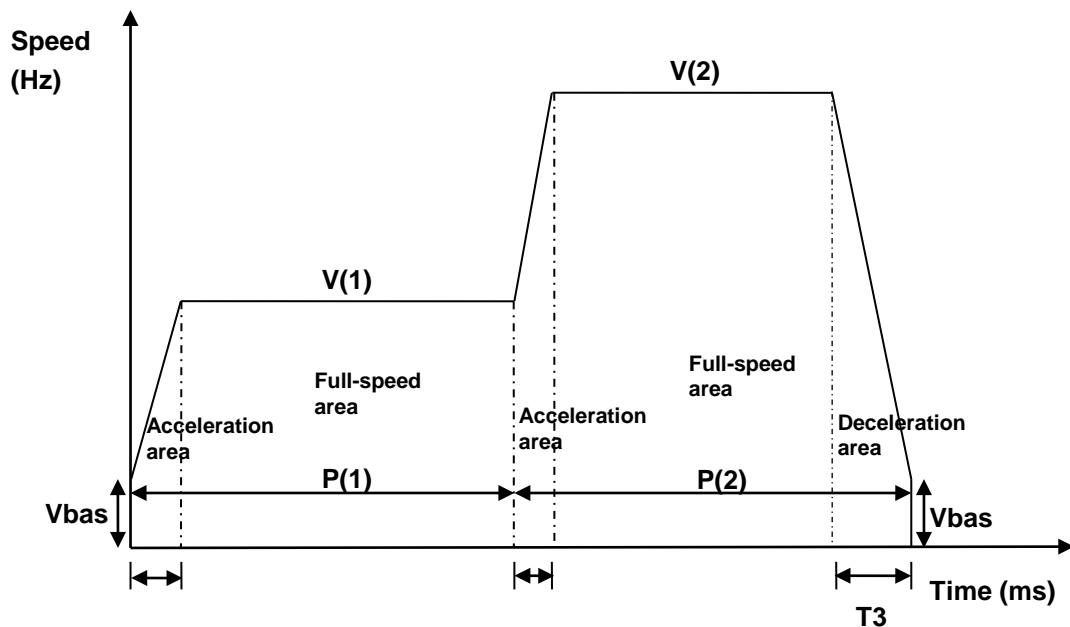
The area before V(1) is an acceleration area.

V(1) is the first full-speed area.

The area after V(1) is an acceleration area.

V(2) is the second full-speed area.

The area after V(2) is a deceleration area.



Vbase	T1+T2	T3	P(1)	V(1)	P(2)	V(2)
Starting frequency	Acceleration time	Deceleration time	Position of the first speed	First speed	Position of the second speed	Second speed

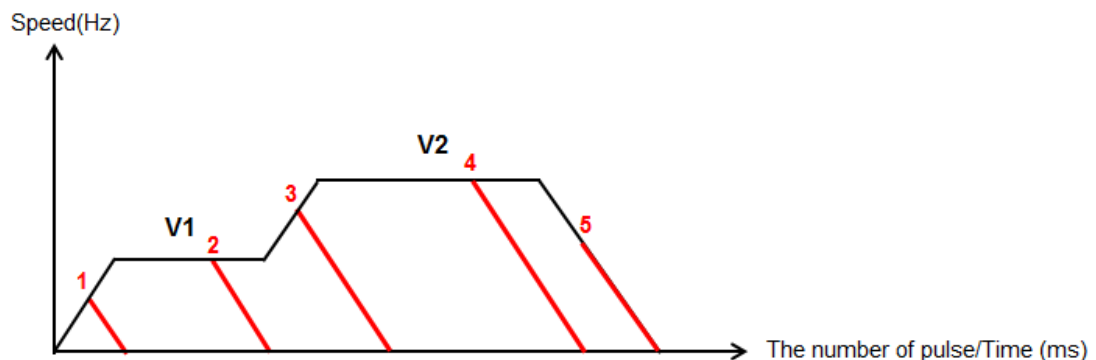
Suppose the starting frequency of CH0 is 0 Hz.

- The value in (D1232, D1233) is 0 or less than the value in (D1133, D1134).

If marking occurs in the acceleration area, it will decrease and stop. Please see red line 1 and red line 3.

If marking occurs in the full-speed area, it will decrease and stop immediately. Please see red line 2 and red line 4.

If marking occurs in the deceleration area, it will keep decreasing. Please see red line 5.



- The value in (D1232, D1233) is greater than the value in (D1133, D1134).

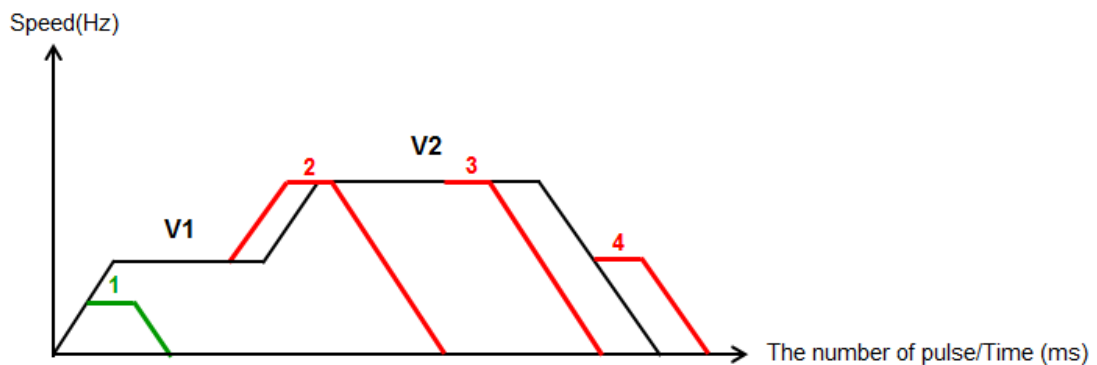
If marking occurs in the acceleration area, there will be two situations.

The number of deceleration pulses is not sufficient to accomplish the full speed (Value in (D1232, D1233) < Value in (D1127, D1128) + Value in (D1133, D1134)). Please see green line 1.

The number of deceleration pulses is sufficient to accomplish the full speed (Value in (D1232, D1233) > Value in (D1127, D1128) + Value in (D1133, D1134)). Please see red line 2.

If marking occurs in the full-speed area, it will decrease according to the value in (D1133, D1134). Please see red line 3.

If marking occurs in the deceleration area, it will decrease according to the value in (D1133, D1134). Please see red line 4.

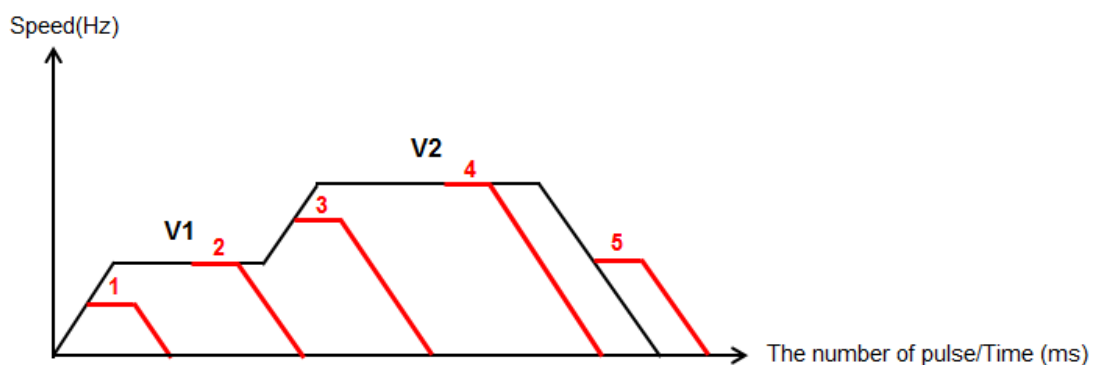


- The value in (D1232, D1233) is equal to the value in (D1133, D1134).

If marking occurs in the acceleration area, it will decrease according to the value in (D1133, D1134). Please see red line 1 and red line 3.

If marking occurs in the full-speed area, it will decrease according to the value in (D1133, D1134). Please see red line 2 and red line 4.

If marking occurs in the deceleration area, it will decrease according to the value in (D1133, D1134). Please see red line 5.



7 Fixed Slope Function

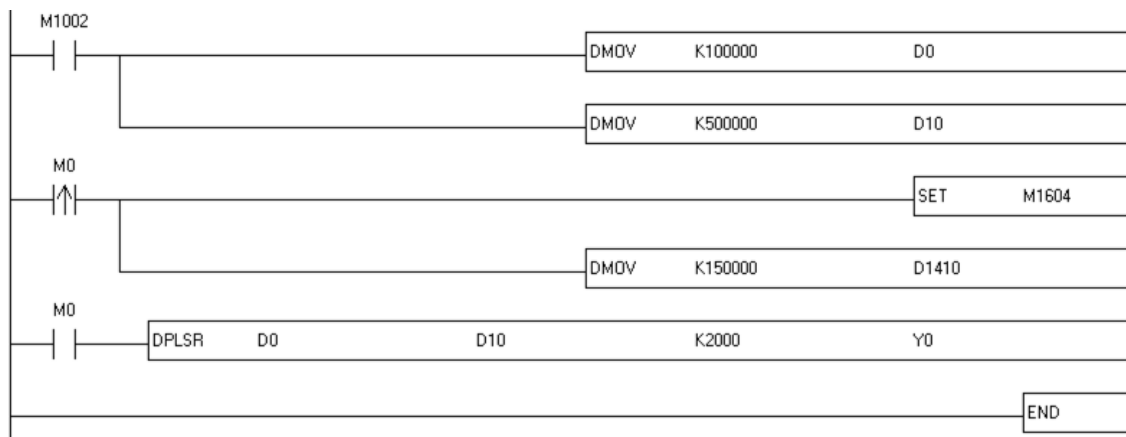
【Control requirement】

The maximum frequency of the fixed slope in an acceleration area and the maximum frequency of the fixed slope in a deceleration area are set. During the execution of the instruction DPLSR, Y0 outputs 500000 pulses on a frequency of 100 kHz and then stop. (A DVP-EH3 series PLC is used in this example.)

【Device description】

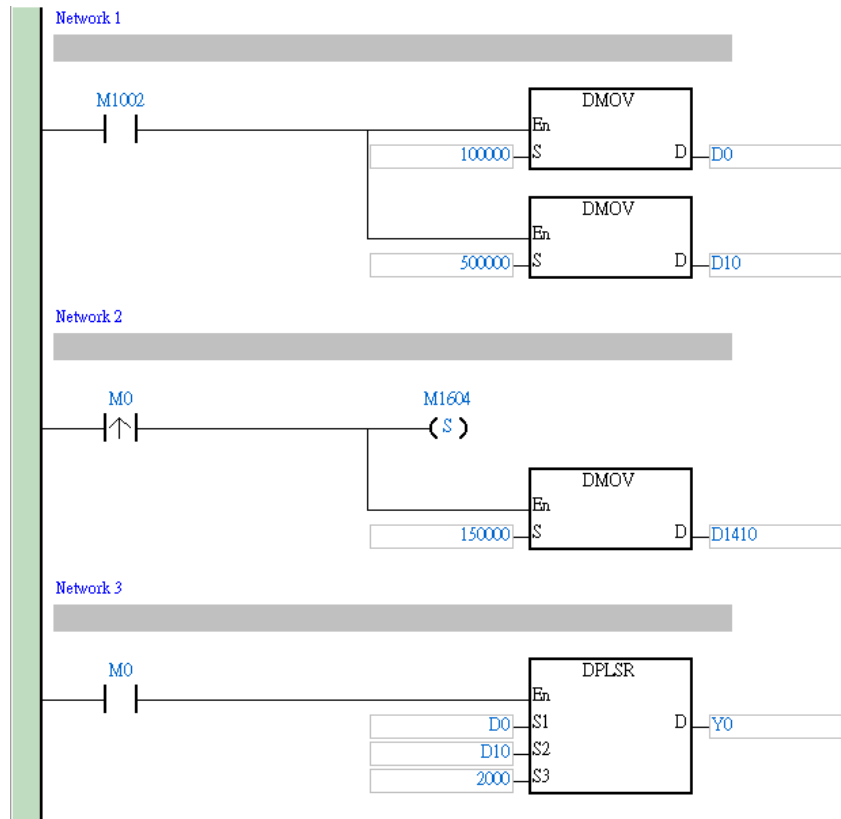
Device	Description
D0	The value in D0 indicates the pulse output frequency specified for DPLSR.
D10	The value in D10 indicates the number of output pulses specified for DPLSR.
D1410	It is used to set the maximum frequency of the fixed acceleration/deceleration slope for CH0
M0	M0 is used to enable DPLSR.
M1604	It is used to enable a fixed acceleration/deceleration slope for CH0 (ON: Enable; OFF: Disable)
Y0	Pulse output device specified for DPLSR

【WPLSoft program】



【ISPSOft program】

Cyclic POU:



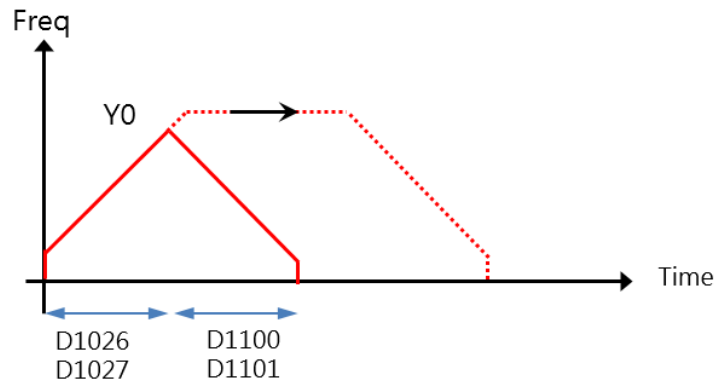
【Control description】

- Write 2000 to D1343 and D1348, and write 150 to D1410.
- The pulse output frequency specified for DPLSR is 100 kHz, and the number of output pulses specified for DPLSR is 500000.
- If M0 is turned from OFF to ON, Y0 will begin to output pulses.
- The maximum frequency of the fixed acceleration/deceleration slope for CH0 is 150 kHz. Y0 outputs 500000 pulses on a frequency of 100 kHz. After Y0 stops, the completion flag M1029 will be ON.

8 Descriptions of behaviors A-C

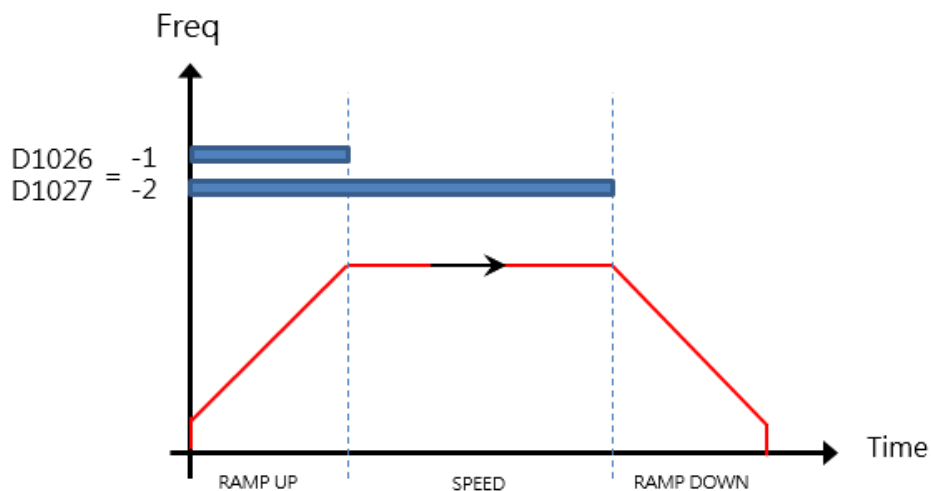
A. When the number of pulses is not sufficient to complete acceleration/deceleration, marking and masking are added in the area.

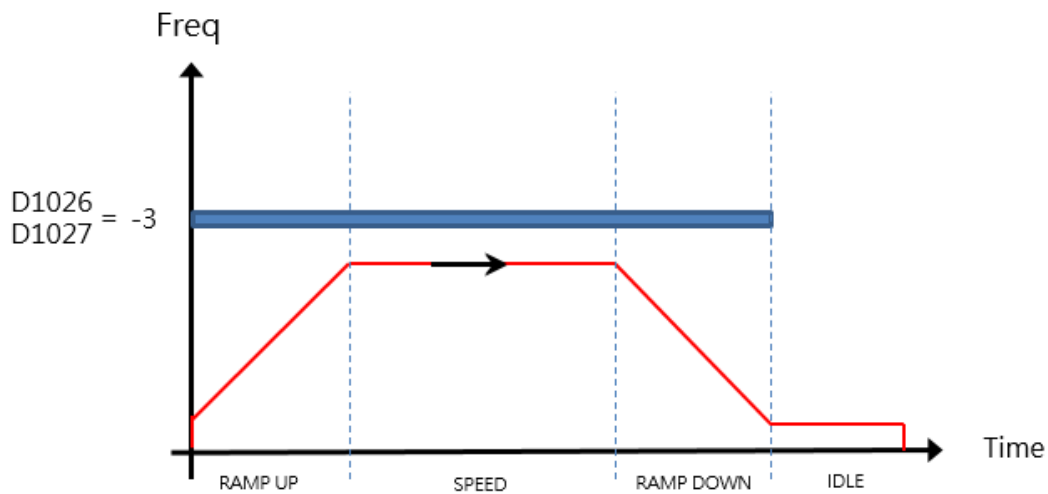
See the Y0 example below. The masking in D1026/1027 of the front masking area and D1100/1101 of the back masking area are effective.



B. When the masking number is -1 in the front masking area, it indicates masking occurs in the acceleration area; -2 in the front masking area means masking occurs in the areas of acceleration and full-speed; -3 (only available for DCLLM instruction) in the front masking area means masking occurs in the areas of acceleration, full-speed and deceleration.

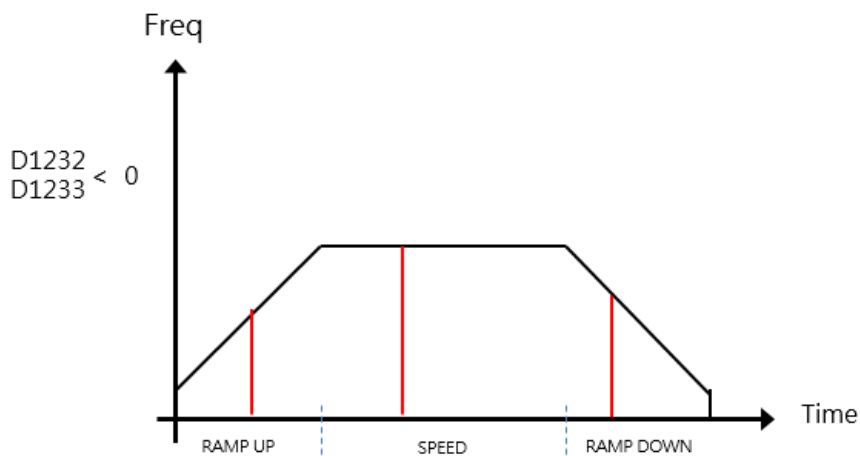
See the Y0 example below. The values of D1026/1027 in front masking area are set among -1 to -3. The masking can be done accordingly, you do not need to calculate the number of pulses in each area.





C. You can set number of deceleration pulses after marking to less than 0 (<0) and when marking is done, the output stopped immediately.

See the Y0 example below. If you set the number of deceleration pulses after marking to less than 0 in D1232/1233, the output stopped immediately after it received the signal, whether it's in the area of acceleration, full-speed or deceleration.



- When a PLC outputs pulses at a high speed, it calculates the number of deceleration/acceleration pulses required, and automatically writes the number of deceleration/acceleration pulses to the special D devices described in the table below.

Special D devices	Description	Attribute
D1127/D1128	Number of acceleration pulses for a positioning instruction	Read-only
D1133/D1134	Number of deceleration pulses for a positioning instruction	Read-only

【Fixed slope function】

A general acceleration/deceleration slope is determined by a starting frequency, a closing frequency, a target frequency, acceleration time, and deceleration time. Please see the back line below for more information about acceleration and deceleration. If the starting frequency and the acceleration/deceleration time are fixed, the black slopes will vary with the target frequency.

A fixed acceleration/deceleration slope is determined by a starting frequency, a closing frequency, a maximum frequency, acceleration time, and deceleration time. Please see the red line below for more information about acceleration and deceleration. If the target frequency is changed, the acceleration slope and the deceleration slope will not be changed.

The function can be used to drive step motors in that it can prevent the adjustment of a target frequency from causing a step motor to stall.

